Great Lakes Cooperative Monitoring Program
Fish Contaminant Monitoring

Inter-Laboratory Comparison Study Survey Results

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- Participating Laboratory Survey Responses
    - MDEQ
    - Environment Canada
    - GLIFWC
    - State of Illinois
    - State of Indiana
    - CORA – ITFAP
    - State of Minnesota
    - State of Ohio
    - Ministry of the Environment
    - State of Pennsylvania
    - State of Wisconsin
    - State of New York
    - EPA - GLNPO

Great Lakes Cooperative Monitoring Program
Fish Contaminant Monitoring

Inter-agency Fish Contaminant Study Draft Project Overview

The Binational Executive Committee (BEC) has endorsed Cooperative Monitoring as a mechanism to improve the binational coordination of monitoring, and as a means to address LaMP key information needs. According to an established rotational cycle, Lake Superior is the focus of Cooperative Monitoring for 2005 and 2006. One of the key information needs identified by the Lake Superior LaMP Work Group is to determine the potential causes for within year differences in fish contaminant results reported by the various agencies implementing periodic monitoring programs. As a way to address this issue, a three-phase plan is being proposed by the Cooperative Monitoring Steering Committee and would involve the following stakeholders:

Stakeholders:
Environment Canada
EPA/GLNPO
Ontario Ministry of the Environment
State of Michigan
State of Minnesota
Sate of Wisconsin
State of Illinois
State of Indiana
State of Ohio
State of New York
State of Pennsylvania
GLIFWIC
CORA
MCT

Phase 1

A survey will be sent to each stakeholder to identify the current protocols for collection and analysis of fish tissue used by each agency. Summary results will be disseminated and shared as a way to describe differences in techniques among participating agencies.

The survey will be comprised of the following questions:

1. Where and when are fish collected and at what frequency? (i.e open lake, river mouth/ annually each spring, fall etc.)
2. What are the 3 most common fish species collected at the above sites?
3. What is the preferred type of tissue sample used for analysis (skinless dorsal muscle, skin-on dorsal or ventral muscle, cross-section etc.)?
4. What biological variables are measured on each fish (weight, length, age, sex etc.)?
5. Are samples analyzed as individuals or composites?
6. If samples are analyzed as composites, explain criteria used to create composite (i.e. # of fish per sample, sorted by length, sorted by weight, size range or all one size etc.)?
7. Define other biological variables measured on fish tissue samples (% lipid, % moisture etc.)?

8. Briefly describe or reference the analytical methods used to analyze organic chemicals & metals (simple descriptions for both – i.e. GC/ECD, MSD, AA, ICAP etc.) and provide method detection limits for each analyte analyzed for.
9. Describe how data are maintained (MS compatible database)?

Results will be disseminated among participants, and discussions held to identify differences in protocols that may potentially result in differences in reported results.

Phase 2
A series of uniform injectable fish tissue extracts will be purchased and supplied to all stakeholders. Each stakeholder laboratory will be asked to analyze the 3 samples and submit the results in order to describe differences between analytical facilities. Results will be shared with all stakeholders and discussion will focus on identifying differences in analytical technique at the instrument level that may potentially result in differences in reported results.

Phase 3
Three uniform Great Lakes whole fish homogenate standards will be purchased/created and supplied to all stakeholders. Each stakeholder laboratory will be asked to analyze the standard samples according to their own their preferred method, including spikes etc., and submit results in order to determine differences between analytical methods. Results will be shared with all stakeholders. The purpose of this phase of the study is to assess the differences in results arising from the laboratory workup and preparation of samples.

Timeline
Multi-Agency Intercomparison Study

Timeframe	Phase I	Phase II	PhaseIII
Month 1	Participants review proposed plan and finalize it during a conference call		
Month 2	GLNPO sends out survey to stakeholders		
Month 3	Responses, including recent data, submitted to GLNPO		
Month 5	Summary distributed to all participants and conference call scheduled to discuss		
Month 6		Meeting Plan Phase II	
Month 7		Standards distributed to all stakeholders	
Month 7		Analyse Stds.	
Month 9		Submit results to GLNPO	
Month 11		Summary results distributed to all participants	
Month 12		Meeting to review Phase II results and to plan Phase III	
Month 13			Prepare and ship fish homogenate

Timeframe	Phase I	Phase II	PhaseIII
			sub-samples to all stakeholder laboratories
Month 15			Laboratory preparation and analysis
Month 16			Submit results to GLNPO
Month 18			Summary results distributed to all participants
Month 15			Meeting to review Phase III and prepare summary report for LSWG

Background and Instructions:

The intent of this questionnaire is to learn more about the current protocols for collection and analysis of fish tissue used by your Fish Contaminant Monitoring Program (FCMP) and techniques used by your agency to determine spatial and temporal trends of contaminants in fish from all Great Lakes. This survey builds upon an MDEQ survey sent around in previous years. Please fill out the survey or update your previous responses. Summary results will be disseminated and shared as a way to describe differences in techniques among participating agencies. The questionnaire is divided into four parts:

I. Program Description
II. Program Logistics
III. Quality Control, Data Analysis, and Interpretation of Trends
IV. Conclusion and Summaries

In some cases, the FCMPs include several elements with different goals and designs (e.g., edible portion, young-of-year (YOY), or whole adult fish). If your program has multiple elements, then it would be helpful to the Interlaboratory Comparison Study if the questions were answered separately for each element. We have provided three copies of the questionnaire for this purpose. We have also provided the entire questionnaire and your previous answers on CD should you wish to respond electronically. Please feel free to append reports or other written materials when you feel that they will answer questions posed below.

Please send survey responses, reports, or other written materials to Beth Murphy at:

murphy.elizabeth@epa.gvo

Or

U.S. Environmental Protection Agency
Great Lakes National Program Office
MC 17J
77 W. Jackson Blvd.
Chicago, IL 60604

If you would like additional information about the questionnaire or the project, please contact Beth. Murphy at 312-353-4227 or Michael Whittle at 905-336-4565. We would appreciate receiving your responses by February 1, 2006. . Thank you in advance for your assistance.

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   _____ Edible-portion monitoring program
   _____ Other (please specify)

   Please attach a description of each element to this questionnaire. Additionally, if your program includes different elements, please answer questions 2 through 25 for each element.

2. What are the explicit goals of your FCMP (or individual program element)?

   _____ Collection of data for issuing fish consumption advisories
   _____ Evaluation of trends of chemicals in the environment
   _____ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? _____

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? ___Yes ___No

If you answered yes, when did these changes occur, what were these changes, and what efforts, if any, were made to make previous data compatible with past? As an example, we have included the following information from MDEQ's whole-fish trend monitoring program, but feel free to follow a different format if that works better for your program.

FCMP Element	Date (Initiation or Change)	Description (brief description of program or change)
Whole fish trend monitoring	2001	Added Hg to GLFMP's routine analyte list.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

_____ Great Lakes
_____ Great Lakes connecting channels
_____ Inland rivers
_____Inland lakes
_____ Reservoirs or impoundments
_____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

_____ Every year
_____ Fixed intervals (please describe)
_____ Based on a randomized design
_____ Case by case determination (if so, can you describe criteria)
_____ Other (please describe)

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

_____ Total length
_____ Standard length
_____ Fork length
_____ Weight
_____ Age
_____ Gender
_____ Reproductive condition
_____ Lipid level or fat content
_____ Other (please describe)?

8. What species of fish are collected? (Please check all that apply)

_____ Lake Trout
_____ Sicowet Lake Trout
_____ Coho Salmon
_____ Chinook Salmon
_____ Brown Trout
_____ Rainbow Trout
_____ Walleye
_____ Carp
_____ Yellow Perch
_____ Smallmouth Bass
_____ Largemouth Bass
_____ White perch
_____ Smelt
_____ Alewife
_____ Northern Pike
_____ Other? (please list)

9. What tissue is collected? (Please check all that apply)

_____ Whole fish
_____ Untrimmed fillet with skins
_____ Trimmed fillet with skins
_____ Untrimmed skinless fillets
_____ Trimmed skinless fillets
_____ Dorsal plugs (please describe the length, width and weight)

_____ Other? (please elaborate)

10. Are individual or composite samples analyzed?

_____Individual fish or fish tissues are analyzed.

_____Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

_____ species
_____ age
_____ length
_____ weight
_____ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level
_____ PCBs		
_____ Arochlors		
_____ Congeners		
_____ ΣDDT		
_____ o,p' DDT		
_____ p,p' DDT		
_____ p,p' DDE		
_____ p,p' DDD (TDE)		
_____ Mirex		
_____ Photomirex		
_____ Σ Chlordane		
_____ *α*-chlordane		
_____ *γ*-chlordane		
_____ cis-nonachlor		
_____ trans-nonachlor		
_____ oxychlordane		
_____ Toxaphene		
_____ Aldrin		
_____ Dieldrin		
_____ Endrin		
_____ Octachlorostryrene		
_____ Heptachlor epoxide		
_____ BHC		
_____ α BHC		
_____ δ BHC		
_____ γ BHC		
_____ Other Chemicals? Please list.		

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

_____Fish collected from the same location
_____Same species of fish collected
_____Same size of fish collected
_____Same age of fish collected
_____Same sex of fish collected
_____Same collection time
_____Lipid normalization
_____Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

Thanks again for your time and effort on these questions.

Michigan Department of Environmental Quality Contaminant Trend Monitoring Program *Caged Fish*

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   __X__ Caged-organism monitoring program
   _____ Edible-portion monitoring program
   _____ Other (please specify)

2. What are the explicit goals of your FCMP (or individual program element)?

   _____ Collection of data for issuing fish consumption advisories
   __X__ Evaluation of trends of chemicals in the environment
   __X__ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? ___16 years

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? _X_Yes ___No

   Sampling None Stated

   Analytical In 2000, switched from polychlorinated biphenyl (PCB) Aroclors® to PCB congener analyses. The results of congener and Aroclor® analyses were compared in 450 samples in order to ensure method comparability.

Summary of survey responses

	MDEQ Caged Fish	MDEQ fillets	MDEQ Whole Fish	Canadian DFO	GLIFWC FCMP	Illinois FCMP	Indiana FCMP	ITFAP FCMP	Minnesota FCMP	Ohio FCMP	Ontario FCMP	PA FCMP	Wisconsin DNR	NY YOY FCMP	NY LOCTS	GLFMP whole fish	GLFMP sport fish
Type of Monitoring?																	
Whole adult fish			X	X			X						X			X	
YOY											X		X	X			
Caged fish	X												X				
Edible portion		X			X	X	X	X	X	X	X	X	X		X		X
Other												X	X				
Explicit Goals?																	
Data for consumption advisories		X			X	X	X		X	X	X	X	X		X		
Evaluation of trends	X	X	X	X	X		X		X		X		X	X	X	X	
Evaluation of Effectiveness	X	X	X	X			X		X	X	X		X	X	X		
Evaluation of env. quality		X			X	X	X			X	X		X	X	X		
Other					X			X									X
Duration of Program (years)?	16	30	11	28	16	32	28	15	15	22 formarly 13 informally	30	27	35	22	30	30	26
Any Changes to Protocol?	X	X	X	X	No	X	X	X	X	No	X	X	X	X	X	X	X
Sampling			X			X	X					X	X	X		X	X
Analytical	X	X	X	X		X	X	X	X		X	X	X	X		X	X
Other		X				X	X										
What Type of Systems?																	
Great Lakes		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Connecting Channels		X	X				X				X			X			
Inland rivers	X	X	X			X	X		X	X	X	X	X				
Inland lakes	X	X	X		X	X	X		X	X	X	X	X				
reservoirs/ impoundments	X	X	X		X	X	X		X	X	X	X	X				
Other												X	X				X
How Frequently Sampled?																	
Every year				X												X	X
Fixed intervals			X		X	X	X	X	X			X	X	X			
Randomized design							X										
Case by case	X	X			X	X				X		X	X		X		
Other						X			X	X	X	X	X		X		

	MDEQ Caged Fish	MDEQ fillets	MDEQ Whole Fish	Canadian DFO	GLIFWC FCMP	Illinois FCMP	Indiana FCMP	ITFAP FCMP	Minnesota FCMP	Ohio FCMP	Ontario FCMP	PA FCMP	Wisconsin DNR	NY YOY FCMP	NY LOCTS	GLFMP whole fish	GLFMP sport fish
What Information Collected?																	
Total length	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Standard length																	
Fork tail length		X	X	X													
Weight	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Age	X	X		X	X			X	X				X	X	X	X	X
Gender		X	X	X	X			X			X	X	X			X	X
Reproductive condition								X				X					
Lipid Level or fat content	X	X	X	X	X	X	X	x		X	X	X	X	X	X	X	X
Moisture content					X		X					X		X	X		
Presence of wounds/ diseases/tumors				X				X				X					
Other	X			X	X			X								X	X
What Species?																	
Lake trout		X	X	X	X	X	X	X			X	X	X		X	X	
Sicowet lake trout		X			X				X		X		X				
Coho salmon		X				X	X		X		X	X	X		X		X
Chinook salmon		X				X	X		X		X		X		X		X
Brown trout		X				X	X			X	X	X	X		X		
Rainbow trout		X				X	X		X	X	X	X	X		X		X
Walleye		X	X	X	X	X	X	X	X	X	X	X	X			X	
Carp		X	X			X	X		X	X	X	X	X				
Yellow perch		X				X	X		X	X	X	X	X				
Smallmouth bass		X				X	X		X	X	X	X	X		X		
Largemouth bass		X	X			X	X		X	X	X	X	X				
White perch		X					X			X	X	X	X				
Smelt		X		X		X	X				X		X				
Alewife		X		X		X	X				X		X				
Northern pike		X					X		X	X	X	X	X				
Channel catfish	X	X				X	X		X	X	X		X				
Crappie		X				X	X		X	X	X		X				
Whitefish		X			X			X		X	X		X				
Winter flounder																	
Other				X	X	X	X		X	X	X	X	X	X			

	MDEQ Caged Fish	MDEQ fillets	MDEQ Whole Fish	Canadian DFO	GLIFWC FCMP	Illinois FCMP	Indiana FCMP	ITFAP FCMP	Minnesota FCMP	Ohio FCMP	Ontario FCMP	PA FCMP	Wisconsin DNR	NY YOY FCMP	NY LOCTS	GLFMP whole fish	GLFMP sport fish
What Tissue?																	
Whole fish	X		X	X			X		X	X	X		X	X		X	
Untrimmed fillet with skins		X			X	X	X		X	X		X	X		X		X
Trimmed fillet with skins					X												
Untrimmed skinless fillets					X	X	X	X	X	X		X	X				
Trimmed skinless fillets		X			X												
Dorsal plugs											X						
Other		X			X	X	X					X	X		X		
How Are Samples Analyzed?																	
Individual fish/ tissue analyzed		X	X	X	X		X	X	X	X	X		X		X		
Composite sample fish/tissue analyzed	X	X		X	X	X	X		X	X	X	X	X	X		X	X
Species	X	X		X	X	X	X		X	X	X	X	X	X		X	
Age	X			X	X				X		X			X			
Length		X		X	X	X	X	X	X	X	X	X	X			X	X
Weight									X	X	X						
Collection date				X			X		X	X	X	X	X	X		X	X
Sample volume	X	X												X			
Other										X							
Analytes Measured?																	
PCBs (aroclors)	X	X	X	X	X	X	X		X	X	X	X	X	X	X		
PCBs (congeners)	X	X	X	X				X			X		X	X		X	X
ΣDDT					X	X		X			X					X	X
o,p' DDT					X		X	X			X	X	X			X	X
p,p' DDT	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X
p,p' DDE	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X
p,p' DDD (TDE)	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X
Mirex	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X
Photomirex								X			X	X		X	X		
Σ Chlordane	X	X	X	X	X	X		X			X					X	X
α- chlordane	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X
γ-chlordane	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X
cis-nonachlor	X	X	X		X		X	X		X	X	X	X	X	X	X	X
trans-nonachlor	X	X	X		X		X	X		X	X	X	X	X	X	X	X

	MDEQ Caged Fish	MDEQ fillets	MDEQ Whole Fish	Canadian DFO	GLIFWC FCMP	Illinois FCMP	Indiana FCMP	ITFAP FCMP	Minnesota FCMP	Ohio FCMP	Ontario FCMP	PA FCMP	Wisconsin DNR	NY YOY FCMP	NY LOCTS	GLFMP whole fish	GLFMP sport fish
oxychlordane	X	X	X		X		X	X		X	X	X		X	X	X	X
Toxaphene	X	X	X	X	X	X	X	X			X					X	X
Aldrin	X	X	X		X	X	X	X		X	X	X		X	X	X	X
Dieldrin	X	X	X	X	X	X	X	X		X	X	X	X			X	X
Endrin				X	X	X	X	X		X	X	X	X			X	X
Octachlorostryrene	X	X	X					X			X					X	X
Heptachlor epoxide	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X
α BHC					X	X	X	X		X	X	X		X	X	X	X
δ BHC					X		X	X		X	X	X		X	X	X	X
γ BHC	X	X	X	X	X	X	X	X		X	X	X		X	X		
Mercury	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Other Chemicals	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Minimum amount of homogenate needed for analysis?	40 g	40 g	40 g	10g	20g/organics, 0.2g/Hg	30 g	30 g	5 g		150g	Contaminant Specific	10 g	25 g organic and 10 g inorganic	2 g	10 g (PCB / OC), 1g (Hg)	20 g	20 g
Methods to Control for Confounding Factors?						None											
Fish collected from the same location	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Same species of fish collected	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Same size of fish collected	X		X		X		X	X	X	X	X		X			X	X
Same age of fish collected	X			X							X			X	X		
Same sex of fish collected											X						
Same collection time	X	X	X	X	X		X	X	X		X		X	X	X	X	X
Lipid normalization	X		X					X			X			X	X	X	X
Other (please elaborate)	X								X								
Other Data Collected?	None	None	None	None	None	None	None	None	X	None	None	None	X	None	None	None	None
pH													X				
Organic carbon																	
TOC																	
Other									X				X				

	MDEQ Caged Fish	MDEQ fillets	MDEQ Whole Fish	Canadian DFO	GLIFWC FCMP	Illinois FCMP	Indiana FCMP	ITFAP FCMP	Minnesota FCMP	Ohio FCMP	Ontario FCMP	PA FCMP	Wisconsin DNR	NY YOY FCMP	NY LOCTS	GLFMP whole fish	GLFMP sport fish
Chemicals Collected in Other Media?	X	X	X	X		X	X	None	X	X	X		X	X		X	X
Water column	X	X	X			X			X								
Sediments	X	X	X			X	X		X	X							
Prey fish											X						
Other	X			X									X			X	X
Archive Tissue Extracts?	No	X	X	X	X	X	No	X	X	No	No	No	X	No	No	X	X
Analyses of Trends	X	X	X	X	X	NA	X	X	X	X	X	X	X	X	X	X	X
t-Test	X						X										
Regression		X	X		X						X	X					
ANCOVA		X															
Other				X	X			X	X	X	X	X	X	X	X	X	X
Transformation of data			X		X												
Type of transformation													X				

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   ____ Great Lakes
   ____ Great Lakes connecting channels
   _X_ Inland rivers
   _X_ Inland lakes
   _X_ Reservoirs or impoundments
   ____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

   ____ Every year
   ____ Fixed intervals (please describe)
   ____ Based on a randomized design *
   _X_ Case by case determination (if so, can you describe criteria)
   ____ Other (please describe)

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

   _X_ Total length
   ____ Standard length
   ____ Fork length
   _X_ Weight
   _X_ Age
   ____ Gender
   ____ Reproductive condition
   _X_ Lipid level or fat content
   _X_ Other (please describe)

   All fish are YOY

8. What species of fish are collected? (Please check all that apply)

   ____ Lake Trout
   ____ Sicowet Lake Trout
   ____ Coho Salmon (GLNPO)
   ____ Chinook Salmon
   ____ Brown Trout
   ____ Rainbow Trout
   ____ Walleye
   ____ Carp
   ____ Yellow Perch
   ____ Smallmouth Bass
   ____ Largemouth Bass
   ____ White perch
   ____ Smelt
   ____ Alewife
   ____ Northern Pike
   _X_ Other? (please list)

   All Young-of-the-year channel catfish

9. What tissue is collected? (Please check all that apply)

__X__ Whole fish
_____ Untrimmed fillet with skins (scaled species)
_____ Trimmed fillet with skins (What do you consider trimmed?)
_____ Untrimmed skinless fillets (smooth skinned species)
_____ Trimmed skinless fillets (What do you consider trimmed?)
_____ Dorsal plugs (please describe the length, width and weight)
_____ Other? (please elaborate)

10. Are individual or composite samples analyzed? Both

_____Individual fish or fish tissues are analyzed.

__X__Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

__X__ species
__X__ age
_____ length
_____ weight
_____ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level (ug/kg)
X PCBs		
X Arochlors (spelled aroclor)		
X Congeners (special cases		
ΣDDT		
o,p' DDT		
X p,p' DDT		
X p,p' DDE		
X p,p' DDD (TDE)		
X Mirex		
Photomirex		
X Σ Chlordane		
X *α*-chlordane		
X *γ*-chlordane		
X cis-nonachlor		
X trans-nonachlor		
X oxychlordane		
X Toxaphene		
X Aldrin		
X Dieldrin		
Endrin		
X Octachlorostryrene		
X Heptachlor epoxide		
BHC		
α BHC		
δ BHC		
X γ BHC		
X Other Chemicals? Please list.		

Hexachlorobenzene, hexachlorostyrene, heptachlorostyrene, pentachlorostyrene, heptachlor, terphenyl, PBB (FF-1, BP-6)

Methods:

PCBs (Aroclors®), DDT, DDE, DDD, α-chlordane, γ-chlordane, cis-nonachlor, trans-nonachlor oxychlordane, toxaphene, dieldrin/endrin, BHC - Packed column gas chromatography and a method developed by MDCH staff (Price et al. 1986)

PCB (congeners) - Gas chromatograph with electron capture device and a modified version of the Mullin et al. (1984) method

Mercury - Atomic absorption spectrophotometer

Quantification Limits:
Terphenyl, mirex & PBB – 5.0 ppb
Toxaphene – 50.0 ppm
Dioxin/furan congeners – vary from 1 to 10 ppt
PCB congeners – vary from 0.2 to 1.0 ppb
All others – 1.0 ppb

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    Each sample has a minimum total weight of 40 g but is ideally 100g, which provides the ability to analyze duplicates.

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply) It depends on what contaminants you are evaluating and how extensive your data set is.

    X Fish collected from the same location
    X Same species of fish collected
    X Same size of fish collected
    X Same age of fish collected
    _ Same sex of fish collected
    X Same collection time
    X Lipid normalization
    _ Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    None

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    PTS in eagle blood
    Great Lakes Herring gull monitoring program
    PTS in air, groundwater, sediment, water, and biota as part of regulatory program clean ups

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Caged-fish samples are not archived.

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    t-Test (temporal and spatial trends)

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

Michigan Department of Environmental Quality Contaminant Trend Monitoring Program *Fillets*

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __X__ Edible-portion monitoring program
   _____ Other (please specify)

2. What are the explicit goals of your FCMP (or individual program element)?

   __X___ Collection of data for issuing fish consumption advisories
   __X__ Evaluation of trends of chemicals in the environment
   __X__ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? ___30 years

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? _X_Yes ___No

   Sampling None Stated

   Analytical In 1987, switched labs due to concerns about quality assurance at lab used prior to 1987. In 2000, switched from PCB Aroclors® to PCB congener analyses. The results of congener and Aroclor® analyses were compared in 450 samples in order to ensure method comparability.

   Other Data collected since 1980 are entered in an electronic database.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   X Great Lakes
   X Great Lakes connecting channels
   X Inland rivers
   X Inland lakes
   X Reservoirs or impoundments
   _____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

   _____ Every year
   _____ Fixed intervals (please describe)
   _____ Based on a randomized design *
   X Case by case determination (if so, can you describe criteria)
   _____ Other (please describe)

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

   X Total length
   _____ Standard length
   X Fork length
   X Weight
   X Age
   X Gender
   _____ Reproductive condition
   X Lipid level or fat content
   X Other (please describe)

8. What species of fish are collected? (Please check all that apply)

   X Lake Trout
   X Sicowet Lake Trout
   X Coho Salmon (GLNPO)
   X Chinook Salmon
   X Brown Trout
   X Rainbow Trout
   X Walleye
   X Carp
   X Yellow Perch
   X Smallmouth Bass
   X Largemouth Bass
   X White perch
   X Smelt
   X Alewife
   X Northern Pike
   X Other? (please list)

   white sucker, bluegill, yellow perch, splake, black crappie, lake sturgeon, rock bass, black bullhead, brown bullhead, sunfish, brook trout, freshwater drum, redhorse sucker, Unionidae, lake herring, muskellunge, gizzard shad, chub, longnose sucker, burbot, tiger muskie, minnow, grass pickerel

9. What tissue is collected? (Please check all that apply)

_____ Whole fish
__X__ Untrimmed fillet with skins (scaled species)
_____ Trimmed fillet with skins (What do you consider trimmed?)
_____ Untrimmed skinless fillets (smooth skinned species)
__X__ Trimmed skinless fillets (What do you consider trimmed?)
_____ Dorsal plugs (please describe the length, width and weight)
__X__ Other? (please elaborate)

Sturgeon: skin off steak
Smelt: headless gutless

10. Are individual or composite samples analyzed? Both

__X__ Individual fish or fish tissues are analyzed.

__X__ Tissue from more than one fish is combined into a composite sample.
Chinook/ coho salmon and small fish

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

__X__ species
_____ age
__X__ length
_____ weight
_____ collection date
__X__ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level (ug/kg)
X PCBs		
X Arochlors (spelled aroclor)		
X Congeners (special cases		
ΣDDT		
o,p' DDT		
X p,p' DDT		
X p,p' DDE		
X p,p' DDD (TDE)		
X Mirex		
Photomirex		
X Σ Chlordane		
X *α*-chlordane		
X *γ*-chlordane		
X cis-nonachlor		
X trans-nonachlor		
X oxychlordane		
X Toxaphene		
X Aldrin		
X Dieldrin		
Endrin		
X Octachlorostryrene		
X Heptachlor epoxide		
BHC		
α BHC		
δ BHC		
X γ BHC		
X Other Chemicals? Please list.		

Hexachlorobenzene, hexachlorostyrene, heptachlorostyrene, pentachlorostyrene, heptachlor, terphenyl, PBB (FF-1, BP-6)

Methods:

PCBs (Aroclors®), DDT, DDE, DDD, α-chlordane, γ-chlordane, cis-nonachlor, trans-nonachlor oxychlordane, toxaphene, dieldrin/endrin, BHC - Packed column gas chromatography and a method developed by MDCH staff (Price et al. 1986)

PCB (congeners) - Gas chromatograph with electron capture device and a modified version of the Mullin et al. (1984) method

Mercury - Atomic absorption spectrophotometer

Quantification Limits:
Terphenyl, mirex & PBB – 5.0 ppb
Toxaphene – 50.0 ppm
Dioxin/furan congeners – vary from 1 to 10 ppt
PCB congeners – vary from 0.2 to 1.0 ppb
All others – 1.0 ppb

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    Each sample has a minimum total weight of 40 g but is ideally 100g, which provides the ability to analyze duplicates.

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply) It depends on what contaminants you are evaluating and how extensive your data set is.

    __X__ Fish collected from the same location
    __X__ Same species of fish collected
    _____ Same size of fish collected
    _____ Same age of fish collected
    _____ Same sex of fish collected
    __X__ Same collection time
    _____ Lipid normalization
    _____ Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    None

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    Water column
    Sediments

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Yes – Some (e.g. Isle Royal Lake Trout)

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Regression – Estimate concentration vs. length
    ANCOVA – Spatial trends

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

    We are considering developing a randomized sampling design for inland lakes, incorporating limnological factors, to allow extrapolation of results over broader areas.

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

Michigan Department of Environmental Quality Contaminant Trend Monitoring Program *Whole Fish*

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   __X__ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   _____ Edible-portion monitoring program
   _____ Other (please specify)

2. What are the explicit goals of your FCMP (or individual program element)?

   _____ Collection of data for issuing fish consumption advisories
   __X__ Evaluation of trends of chemicals in the environment
   __X__ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? __11 years__

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? __X__Yes ___No

   Sampling In 1990, initiated fixed station whole fish trend monitoring program at 27 sites. In 1996, dropped one station because there was difficulty in collection samples.

   Analytical In 2000, switched from PCB Aroclors® to PCB congener analyses. The results of congener and Aroclor® analyses were compared in 450 samples in order to ensure method comparability.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   __X__ Great Lakes
   __X__ Great Lakes connecting channels
   __X__ Inland rivers
   __X__ Inland lakes
   __X__ Reservoirs or impoundments
   _____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

   _____ Every year
   __X__ Fixed intervals (please describe)
   _____ Based on a randomized design *
   _____ Case by case determination (if so, can you describe criteria)
   _____ Other (please describe)

   Every 2 years

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

   __X__ Total length
   _____ Standard length
   __X__ Fork length
   __X__ Weight
   _____ Age
   __X__ Gender
   _____ Reproductive condition
   __X__ Lipid level or fat content
   _____ Other (please describe)

8. What species of fish are collected? (Please check all that apply)

   __X__ Lake Trout
   _____ Sicowet Lake Trout
   _____ Coho Salmon (GLNPO)
   _____ Chinook Salmon
   _____ Brown Trout
   _____ Rainbow Trout
   __X__ Walleye
   __X__ Carp
   _____ Yellow Perch
   _____ Smallmouth Bass
   __X__ Largemouth Bass
   _____ White perch
   _____ Smelt
   _____ Alewife
   _____ Northern Pike
   _____ Other? (please list)

9. What tissue is collected? (Please check all that apply)

__X__ Whole fish
_____ Untrimmed fillet with skins (scaled species)
_____ Trimmed fillet with skins (What do you consider trimmed?)
_____ Untrimmed skinless fillets (smooth skinned species)
_____ Trimmed skinless fillets (What do you consider trimmed?)
_____ Dorsal plugs (please describe the length, width and weight)
_____ Other? (please elaborate)

10. Are individual or composite samples analyzed? Both

__X__ Individual fish or fish tissues are analyzed.

_____ Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

_____ species
_____ age
_____ length
_____ weight
_____ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level (ug/kg)
X PCBs		
X Arochlors (spelled aroclor)		
X Congeners (special cases		
ΣDDT		
o,p' DDT		
X p,p' DDT		
X p,p' DDE		
X p,p' DDD (TDE)		
X Mirex		
Photomirex		
X Σ Chlordane		
X *α*-chlordane		
X *γ*-chlordane		
X cis-nonachlor		
X trans-nonachlor		
X oxychlordane		
X Toxaphene		
X Aldrin		
X Dieldrin		
Endrin		
X Octachlorostryrene		
X Heptachlor epoxide		
BHC		
α BHC		
δ BHC		
X γ BHC		
X Other Chemicals? Please list.		

Hexachlorobenzene, hexachlorostyrene, heptachlorostyrene, pentachlorostyrene, heptachlor, terphenyl, PBB (FF-1, BP-6)

Methods:

PCBs (Aroclors®), DDT, DDE, DDD, α-chlordane, γ-chlordane, cis-nonachlor, trans-nonachlor oxychlordane, toxaphene, dieldrin/endrin, BHC - Packed column gas chromatography and a method developed by MDCH staff (Price et al. 1986)

PCB (congeners) - Gas chromatograph with electron capture device and a modified version of the Mullin et al. (1984) method

Mercury - Atomic absorption spectrophotometer

Quantification Limits:
Terphenyl, mirex & PBB – 5.0 ppb
Toxaphene – 50.0 ppm
Dioxin/furan congeners – vary from 1 to 10 ppt
PCB congeners – vary from 0.2 to 1.0 ppb
All others – 1.0 ppb

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    Each sample has a minimum total weight of 40 g but is ideally 100g, which provides the ability to analyze duplicates.

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply) It depends on what contaminants you are evaluating and how extensive your data set is.

    __X__ Fish collected from the same location
    __X__ Same species of fish collected
    __X__ Same size of fish collected
    _____ Same age of fish collected
    _____ Same sex of fish collected
    __X__ Same collection time
    __X__ Lipid normalization
    _____ Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    None

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    Water column
    Sediments

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Yes, since 1996

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Regression – temporal trends
    Transformation of data – logs of wet weight

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

    The Michigan Whole Fish trend program has worked well for detecting trends at given sampling stations, however it was not designed to detect trends over wide areas.

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

Canadian Department of the Environment

Fish Contaminant Trend Monitoring Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   __X__ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   _____ Edible-portion monitoring program
   _____ Other (please specify)

2. What are the explicit goals of your FCMP (or individual program element)?

   _____ Collection of data for issuing fish consumption advisories
   __X__ Evaluation of trends of chemicals in the environment
   __X__ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? __28+ years__

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? __X__ Yes ___ No

   Sampling None stated

   Analytical Laboratory analytical procedures have been modified over the past 28 years. An inter-comparison of data generated by various analytical methods has been made by the reanalysis of samples used to generate "historical data" (i.e., comparison of total PCB measurements via pack column vs. capillary column GC methods) (see Huestis et al. 1996).

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   __X__ Great Lakes
   _____ Great Lakes connecting channels
   _____ Inland rivers
   _____ Inland lakes
   _____ Reservoirs or impoundments
   _____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

__X__ Every year
_____ Fixed intervals (please describe)
_____ Based on a randomized design
_____ Case by case determination (if so, can you describe criteria)
_____ Other (please describe)

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

__X__ Total length
_____ Standard length
__X__ Fork length
__X__ Weight
__X__ Age
__X__ Gender
_____ Reproductive condition
__X__ Lipid level or fat content
__X__ Other

Lamprey Scarring

8. What species of fish are collected? (Please check all that apply)

__X__ Lake Trout
_____ Sicowet Lake Trout
_____ Coho Salmon
_____ Chinook Salmon
_____ Brown Trout
_____ Rainbow Trout
__X__ Walleye
_____ Carp
_____ Yellow Perch
_____ Smallmouth Bass
_____ Largemouth Bass
_____ White perch
__X__ Smelt
__X__ Alewife
_____ Northern Pike
__X__ Other

Sculpin and invertebrates

9. What tissue is collected? (Please check all that apply)

__X__ Whole fish
_____ Untrimmed fillet with skins
_____ Trimmed fillet with skins
_____ Untrimmed skinless fillets
_____ Trimmed skinless fillets
_____ Dorsal plugs (please describe the length, width and weight)

_____ Other? (please elaborate)

10. Are individual or composite samples analyzed?

___X__Individual fish or fish tissues are analyzed.

Top predator species

___X__Tissue from more than one fish is combined into a composite sample.

Forage fish species

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

___X___ species
___X___ age
___X___ length
_____ weight
___X___ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level
___ PCBs		
X Aroclors		
X Congeners		
___ ΣDDT		
___ o,p' DDT		
X p,p' DDT		
X p,p' DDE		
X p,p' DDD (TDE)		
X Mirex		
___ Photomirex		
X Σ Chlordane		
X *α*-chlordane		
X *γ*-chlordane		
___ cis-nonachlor		
___ trans-nonachlor		
___ oxychlordane		
X Toxaphene		
___ Aldrin		
X Dieldrin		
X Endrin		
___ Octachlorostryrene		
X Heptachlor epoxide		
___ BHC		
___ α BHC		
___ δ BHC		
X γ BHC		
X Other Chemicals?		

Mercury, dioxin / furans, As, Cu, Cd, Pb, Ni, Se, Zn

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    10 g

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

    __X__ Fish collected from the same location
    __X__ Same species of fish collected
    _____ Same size of fish collected
    __X__ Same age of fish collected
    _____ Same sex of fish collected
    __X__ Same collection time
    _____ Lipid normalization
    _____ Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    None

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    Yes, food web samples.

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Yes, large bank of frozen samples and solvent extracts

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Other, Huestis et al. (1996)
    Huestis et al. (1997)
    Borgmann and Whittle (1991b)
    Borgmann and Whittle (1992b)
    Martin et al (2004)
    SOLEC (2004)

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

    None

Martin, J.W., D. M. Whittle, D.C.G. Muir & S.A. Mabury. 2004 Perfluoroalkyl Contaminants in the Lake Ontario Food Web. Environ. Sci. Technol. V 38, No 20 (5379-5385)
Whittle, D.M., M.J. Keir, J. F. Gorrie & E. Murphy. 2004. State of the Lakes Indicators Report: SOLEC Indicator #121 – Contaminants in Whole Fish pp 128-138. http://www.solecregistration.ca/en/reports/default.asp

Great Lakes Indian Fish and Wildlife Commission

Fish Contaminant Trend Monitoring Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __X__ Edible-portion monitoring program
   _____ Other (please specify)

2. What are the explicit goals of your FCMP (or individual program element)?

   ___X__ Collection of data for issuing fish consumption advisories
   ___X__ Evaluation of trends of chemicals in the environment
   _____ Evaluation of effectiveness of pollution control activities
   ___X__ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   ___X__ Others: Please elaborate

   The Great Lakes Indian Fish and Wildlife Commission (GLIFWC) has responsibilities to manage and protect off-reservation treaty rights for its member tribes within the geographic area covered by the 1836, 1837, 1842, and 1854 treaties. GLIFWC has developed a FCMP as a result of tribal representatives expressing concern about the health risk that mercury and other contaminants in fish poses to tribal members. The goals of the program include: protecting tribal health, informing tribal members of the risks associated with contaminants present in fish, providing data that shows whether fish products being sold by tribal commercial fisherman are meeting U.S. Food and Drug Administration (FDA) chemical concentration limits for the commercial sale of fish, providing data that can be used by other agencies and jurisdictions managing Lake Superior, and providing data that may be useful in studying temporal trends in contaminants.

   Since 1989, GLIFWC has monitored mercury in skin-off fillets of walleye. Inland lake monitoring (ILM) of muskellunge skin-off fillets for mercury began in 1999, however, muskellunge have not been monitored since 2003. The number of lakes sampled each year depends on available funding. Priority is given to GLIFWC long-term study lakes and the top 12 tribally harvested lakes. The goal is to sample these lakes on an annual or bi-annual basis. Other lakes are prioritized for sampling based on their tribal harvest ranking, insufficient sample size, or the age of the data. Within each lake, the goal is to collect three walleye

within each of four size groups for a total of twelve fish. If muskellunge are collected, the goal is to collect three fish within each of three size groups for a total of nine fish per lake. Data collected through the ILM are shared with the Wisconsin Department of Natural Resources (WDNR), Michigan Department of Environmental Quality (MI DEQ), and the Minnesota Department of Health (MDH), and are used by GLIFWC to prepare color-coded GIS maps that alert tribal members to mercury concentrations in walleye from ceded territory lakes. The maps also allow tribal members to reduce their risk of mercury exposure by choosing lakes with walleye lower in mercury. These data are also being used to analyze spatial and temporal trends in mercury concentrations in ceded territory lakes.

In addition to the ILM, there was a detailed study of the Lake Superior commercial harvest in 1999−2000, along with detailed studies of lake trout (2003) and whitefish (2004). For these studies, sample sites were selected by their relative importance to the tribal harvest. Fish were collected within narrow size ranges that spanned the size ranges of fish normally harvested by tribal commercial fisherman. Fish were then composited by size and age. Resulting samples were analyzed for total mercury, along with a suite of chlorinated organic compounds described in number 11 below. Results from these studies allow GLIFWC and tribal commercial fisherman to assess whether fish that are being harvested and sold are meeting FDA limits for chemical concentrations in fish tissue, provide data for use by other agencies and jurisdictions managing Lake Superior (including the Lake Superior Binational Program), and provide baseline data for the future study of temporal trends of contaminant concentrations in Lake Superior fish.

3. How long has your program been in existence? 16 years

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? ___Yes __X__No

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

__X__ Great Lakes
_____ Great Lakes connecting channels
_____ Inland rivers
__X__ Inland lakes
__X__ Reservoirs or impoundments
_____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

_____ Every year
__X__ Fixed intervals (please describe)
_____ Based on a randomized design
__X__ Case by case determination (if so, can you describe criteria)
_____ Other (please describe)

Please see program description in number 2.

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

__X__ Total length
_____ Standard length
_____ Fork length
__X*__ Weight
__X__ Age
__X__ Gender
_____ Reproductive condition
__X**__ Lipid level or fat content
__X__ Other (please describe)?

* Round weight or whole weight of Lake Superior fish is measured at the time of collection. Whole weight for ILM walleye and muskellunge is a "frozen" weight measured after the fish is thawed in the lab and ready for processing into fillets.
** We collect percent lipid from our Lake Superior fish samples, but not from our ILM walleye or muskellunge samples.
Other – We also collect weight of the skin-off fillet for ILM walleye samples and "frozen" length of walleye. "Frozen" length is taken after the fish has been thawed, prior to processing.

8. What species of fish are collected? (Please check all that apply)

__X__ Lake Trout
__X__ Siscowet Lake Trout
_____ Coho Salmon
_____ Chinook Salmon
_____ Brown Trout
_____ Rainbow Trout
__X__ Walleye
_____ Carp
_____ Yellow Perch
_____ Smallmouth Bass
_____ Largemouth Bass
_____ White perch
_____ Smelt
_____ Alewife
_____ Northern Pike
__X__ Other? (please list)

Other – We've collected Lake Superior whitefish, herring, and some sturgeon data. Occasionally we collect muskellunge and rarely northern pike from inland waters.

9. What tissue is collected? (Please check all that apply)

_____ Whole fish
__X*__ Untrimmed fillet with skins
__X*__ Trimmed fillet with skins
__X*__ Untrimmed skinless fillets
__X*__ Trimmed skinless fillets
_____ Dorsal plugs (please describe the length, width and weight)
__X**__ Other? (please elaborate)

* Our Lake Superior fish have all been processed as follows: We remove an untrimmed, skin-on fillet from each fish. The fillet is then segmented into fatty tissue, skin, and muscle (edible portion). In the past we have either measured concentrations of contaminants in all three tissue types or measured contaminants only in the muscle tissue and estimated concentrations in fat and skin based on percent lipid. Segmenting the fillets allows for estimates of contaminant concentrations in untrimmed skin-on, trimmed skin-on, and muscle (edible portion) fillets.
Our ILM walleye samples are processed into untrimmed, skin-off fillets.
** A skin-off fillet "chunk" or "steak" is taken for muskellunge samples.

10. Are individual or composite samples analyzed?

___X___Individual fish or fish tissues are analyzed.

___X___Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

__X__ species
__X__ age
__X__ length
_____ weight
_____ collection date
_____ sample volume
_____ Other (please describe)

NOTE – ILM samples are analyzed as individual fish and Lake Superior fish have been analyzed as composites (except for one lake sturgeon sample).

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

    NOTE – all method detection limits (MDL) and estimated quantitation limits (EQL) are given in ug/kg. MDLs change periodically and can be different for individual samples if dilutions occur.

Analyte	Analytical Method	Quantification Level
X PCBs	EPA Method 8082	MDL-12 EQL-50
X Aroclors		
_____ Congeners		
X ΣDDT	All Chlorinated pesticides based on EPA method 8081A	
X o,p' DDT		MDL-1.1 EQL-5.0
X p,p' DDT		MDL-1.1 EQL-5.0
X p,p' DDE		MDL-0.74 EQL-5.0
X p,p' DDD (TDE)		MDL-1.0 EQL-5.0
X Mirex		MDL-0.99 EQL-5.0
_____ Photomirex		
X Σ Chlordane		
X *α*-chlordane		MDL-0.42 EQL-2.5
X *γ*-chlordane		MDL-1.6 EQL-2.5
X cis-nonachlor		MDL-1.0 EQL-5.0
X trans-nonachlor		MDL-0.80 EQL-5.0
X oxychlordane		MDL-0.72 EQL-5.0
X Toxaphene		MDL-46 EQL-250
X Aldrin		MDL-0.42 EQL-2.5
X Dieldrin		MDL-1.1 EQL-5.0
X Endrin		MDL-0.84 EQL-5.0
_____ Octachlorostryrene		
X Heptachlor epoxide		MDL-0.66 EQL-2.5
X BHC		
X α BHC		MDL-0.86 EQL-2.5
X δ BHC		MDL-0.68 EQL-2.5
X γ BHC		MDL-0.48 EQL-2.5
X Other Chemicals? Please list.		
Mercury - Total mercury via cold vapor AA, based EPA method 245.6; MDL-12 EQL-50		
β BHC		MDL-1.1 EQL-2.5

Heptachlor	MDL-0.72 EQL-2.5
Endrin Ketone	MDL-0.90 EQL-5.0
Endrin Aldehyde	MDL-1.0 EQL-5.0
Methoxychlor	MDL-2.8 EQL-25
Hexachlorobenzene	MDL-0.45 EQL-2.5
Pentachloroanisole	MDL-0.36 EQL-2.5
Endosulfan I	MDL-0.43 EQL-2.5
Endosulfan II	MDL-0.80 EQL-5.0
Endosulfan Sulfate	MDL-2.0 EQL-5.0
o,p' DDE	MDL-1.2 EQL-5.0
o,p' DDD	MDL-0.82 EQL-5.0

Percent Moisture

Dioxins and Furans – Our Lake Superior fish samples from 1999-2000 were analyzed for 7 dioxin and 10 furan congeners by Triangle Laboratories, Inc., which is now known as Eno River Labs, Inc. Analysis was based on EPA Method 8290. Results were converted to toxic equivalency concentrations (TEQs) using both EPA and World Health Organization toxic equivalency factors (TEFs).

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

Pace normally extracts a 20 gram sample of fish tissue. They will extract less if the tissue is very lipid-rich or if there isn't 20 grams available. The exact amount is dependent on the analytes of interest and the detection limit desired.

LSRI requires between 0.2 and 0.3 grams of fish tissue for mercury analysis.

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

__X__ Fish collected from the same location
__X__ Same species of fish collected
__X__ Same size of fish collected
_____ Same age of fish collected
_____ Same sex of fish collected
__X__ Same collection time
_____ Lipid normalization
_____ Others? (please elaborate)

We have done several informal analyses of trends of mercury in walleye, and are working on a more formal analysis looking at trends in individual lakes and across northern Wisconsin as a whole. We are using regressions based on time and length of fish. We have used SAS software in the past, and the formal analysis is using winBUGS in order to use a Bayesian approach. Our work is limited to walleye, since that is the species of primary interest for the tribes for

whom we work, and limited to mercury, which represents the bulk of our contaminant data. There are naturally some reasons to want to account for age, but we do not always have age data available, and in addition we prefer to focus on length as a predictor since it is so much easier to gather and since tribal members immediately know the lengths of the fish they harvest but not their ages. We would like to account for sex in our analyses since the sexes grow at different rates, and we collect information on sex in our data. However, we exchange mercury data with the Wisconsin Dept. of Natural Resources and they do not routinely collect information on sex. Since their data comprises a large portion of the data used in our analyses, it makes it problematic to account for sex. Our samples are usually collected at the same time of year, in the early spring. We do not account for lipid normalization. Our samples are collected from fillets with skin off, and WDNR's are collected from fillets with skin on. The agencies agree that there are differences between mercury concentrations in skin-on versus skin-off fillets, however, these differences do not preclude them from using each other's data for issuing fish consumption advisories.

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    NO

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    Typically, no, but we have conducted a study that compared water chemistry characteristics such as pH, dissolved oxygen, conductivity, total dissolved solids, turbidity, REDOX potential, color, sulfide, alkalinity, and temperature in several northern Wisconsin and Michigan reservoirs to mercury concentrations in walleye from those reservoirs. The purpose was to determine whether one or more of these parameters could be useful in predicting mercury concentrations in reservoirs.

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Yes, ILM samples have been archived since 1998 and all Lake Superior fish samples collected have been archived. Archiving is done by placing the ground fish tissue samples into amber glass jars with Teflon-lined lids. The samples are stored in a chest freezer at temperatures at or below -10°C at LSRI in Superior, WI.

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

We use regressions (linear, quadratic, or cubic) with time and length as predictors, as well as sex if possible. We evaluate p-values and R-squared values. As previously mentioned, most of this work has been done rather informally using SAS software in the past, and the formal analysis we are currently working on is using winBUGS to accomplish a Bayesian analysis, which will allow us to make direct probability statements regarding the parameters, which circumvents some of the potential problems with interpreting standard frequentist parameter estimates. We will examine trends on a lake-by-lake basis, as well as on a regional scale. Our time period of interest is from around 1992 through the present.

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

    Obviously it is more difficult to evaluate trends when sample sizes are small, but there are no problems as such that I'm aware of with the methods we've been using. We have noticed very great differences in mercury contaminant levels from lake to lake, so if we were interested only in evaluating regional trends, we would want to spread out our samples to cover more lakes, rather than focusing on smaller subsets of lakes. However, this is not our only interest as an agency. We also want to focus our attention on the lakes that receive more harvest and walleye consumption by tribal members so that we can provide current and accurate information on contaminants in these lakes.

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

Illinois *Fish Contaminant Monitoring Program*

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __X__ Edible-portion monitoring program
   _____ Other (please specify)

2. What are the explicit goals of your FCMP (or individual program element)?

   ____X__ Collection of data for issuing fish consumption advisories
   _____ Evaluation of trends of chemicals in the environment
   _____ Evaluation of effectiveness of pollution control activities
   ___X___ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? Since 1974_____

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? __X__Yes ___No

   Sampling In 1976, the Illinois Department of Conservation (IDOC) expanded fish contaminant sampling to include 40 state lakes, a few public lakes and three U.S. Army Corps of Engineers lakes. In 1983, a memorandum agreement coordinated sampling with the IDOC/Illinois Environmental Protection Agency (IEPA) Basin Survey program. In 1989, modifications to routine sampling sites were made.

   In 1992, a lack of funding required that the FCMP was reduced to sampling in Lake Michigan and a few specific problem areas only.

   Analytical In 1984, analysis of mercury was suspended based on an analysis of historical data.

   In 1985, new procedures for quality assurance in laboratories (IEPA, Illinois Department of Public Health [IDPH], Illinois Department of Agriculture) were required to meet quality assurance and quality control (QA/QC) spiked sample testing supplied through the U.S. Environmental Protection Agency (EPA) and U.S. Food and Drug Administration (FDA) quality assurance programs.

In 1986, the *Work/Quality Assurance Guidance Plan* was revised so that all fish contaminant samples were analyzed by the IEPA labs. In 1992, analysis of mercury was reinstated for all predator samples collected.

In 1997, the *Protocol for a Uniform Great Lakes Sport Fish Advisory on Lake Michigan* was adopted, using the actual levels of contaminants found in a single sample rather than the percentage exceeding the action level for several samples.

Other In 1977, IDPH, IDOH, FDA, IEPA and IDOC coordinated fish contaminant sampling and established quality control procedures. It was agreed that all data were to be stored in the EPA computer system, STORET, through IEPA.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

__X__ Great Lakes
_____ Great Lakes connecting channels
__X__ Inland rivers
__X__ Inland lakes
__X__ Reservoirs or impoundments
_____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

_____ Every year
__X__ Fixed intervals (please describe)
_____ Based on a randomized design
__X__ Case by case determination (if so, can you describe criteria)
__X__ Other (please describe)

Fixed intervals: Every 2-4 years for waters with existing advisories, every 5 – 10 years for water without advisories; if sample(s) from waters without advisories have contaminant levels exceeding criteria, sampling is repeated within 2 years.

Case-by-case determination: If sample(s) from waters without advisories have contaminant levels exceeding criteria are followed up and the 2 sampling events are still inadequate for determining advisories, a third sample is collected.
Other: Special studies/investigations are occasionally undertaken, with monitoring designs appropriate to the study (often intensive).

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

- [X] Total length
- [ ] Standard length
- [ ] Fork length
- [X] Weight
- [ ] Age
- [ ] Gender
- [ ] Reproductive condition
- [X] Lipid level or fat content
- [ ] Other (please describe)?

8. What species of fish are collected? (Please check all that apply)

- [X] Lake Trout
- [ ] Sicowet Lake Trout
- [X] Coho Salmon
- [X] Chinook Salmon
- [X] Brown Trout
- [X] Rainbow Trout
- [X] Walleye
- [X] Carp
- [X] Yellow Perch
- [X] Smallmouth Bass
- [X] Largemouth Bass
- [ ] White perch
- [X] Smelt
- [X] Alewife
- [ ] Northern Pike
- [X] Other? (please list)

Other: flathead catfish, black and yellow bullhead, white and yellow bass, bluegill, sunfish, rock bass, spotted bass, sauger, freshwater drum, smallmouth, bigmouth, and black buffalo

9. What tissue is collected? (Please check all that apply)

- [ ] Whole fish
- [X] Untrimmed fillet with skins (scaled)
- [ ] Trimmed fillet with skins
- [X] Untrimmed skinless fillets (catfish and bullhead species)
- [ ] Trimmed skinless fillets
- [ ] Dorsal plugs (please describe the length, width and weight)
- [X] Other? (please elaborate)

Other: Headless gutted smelt

10. Are individual or composite samples analyzed?

- [ ] Individual fish or fish tissues are analyzed.
- [X] Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

__X__ species
_____ age
__X__ length (smallest fish must be at least 75% of largest)
_____ weight
_____ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level
X PCBs		
X Arochlors		0.1
_____ Congeners		
X ΣDDT		0.01
_____ o,p' DDT		
_____ p,p' DDT		
_____ p,p' DDE		
_____ p,p' DDD (TDE)		
X Mirex		0.01
_____ Photomirex		
X Σ Chlordane		0.02
_____ *α*-chlordane		
_____ *γ*-chlordane		
_____ cis-nonachlor		
_____ trans-nonachlor		
_____ oxychlordane		
X Toxaphene		1.0
X Aldrin		0.01
X Dieldrin		0.01
X Endrin		0.01
_____ Octachlorostryrene		
X Heptachlor epoxide		0.01
X BHC		0.01
X α BHC		0.01
_____ δ BHC		
X γ BHC		0.01
X Other Chemicals? Please list.		
Heptachlor		0.01
Hexachlorobenzene		0.01
Methoxychlor		0.05
Mercury		0.10 – 0.03

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    30 grams

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

No evaluation of trends.

_____Fish collected from the same location
_____Same species of fish collected
_____Same size of fish collected
_____Same age of fish collected
_____Same sex of fish collected
_____Same collection time
_____Lipid normalization
_____Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    None

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    Yes, water column and sediments

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Yes, samples of homogenized fish tissue are archived for 15 years.

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    NA

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

    NA

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

    None

Indiana *Fish Contaminant Monitoring Program*

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   __X__ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __X__ Edible-portion monitoring program
   _____ Other (please specify)

2. What are the explicit goals of your FCMP (or individual program element)?

   __X__ Collection of data for issuing fish consumption advisories
   __X__ Evaluation of trends of chemicals in the environment
   __X__ Evaluation of effectiveness of pollution control activities
   __X__ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? 1977 (28+ years)

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? X Yes ___No

   The program started with the issuance of Indiana's first FCAs – Lake Trout from Lake Michigan. Subsequent monitoring began to occur in relation to a PCB contaminated area. In 1979 we began biennial monitoring at "CORE Program" sites.

   Sampling The most significant issue has been in the preparation of the sample. In the past, cross-sectional stakes had been prepared for Lake Michigan salmonids. There was a period in the 1980s where all tissue samples were prepared as skin off fillets. Bullhead were treated as gutted and beheaded "fiddlers." Today all scaled species are prepared as skin-on scaleless fillets including the belly flap and fatty portion along the spinal column and smooth skinned species are treated as skin-off fillets (see "Sport Fish Advisory Protocol") unless we analyze them as whole fish. Sample preparations are clearly marked in the database and one should always take that into consideration when doing an exploratory analysis on the data.

   Analytical Indiana originally used the Indiana State Department of Health Food and Dairy Labe (now Consumer Health Lab). In 1987 we began to use a contract laboratory service. Essentially it had been the same lab up until 2002

when there was a lab location change because of change in ownership. Method modifications have occurred over the years resulting in a trend of decreasing quantitation limits.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

__X__ Great Lakes
__X__ Great Lakes connecting channels
__X__ Inland rivers
__X__ Inland lakes
__X__ Reservoirs or impoundments (not marked on MI survey because of oversite.)
_____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

_____ Every year
__X__ Fixed intervals (please describe)
__X__ Based on a randomized design *
_____ Case by case determination (if so, can you describe criteria)
_____ Other (please describe)

Fixed interval is coverage of the State on a 5 year rotating basin coverage as part of Indiana's surface water monitoring program. Not all sites are fixed and scheduled for repeat on the rotating basin schedule. The only certain sites for revisit in every basin revisit are the historical CORE Program sites, Lake Michigan (annually), and Ohio River (annual – ORSANCO)

* Sampling of fish tissue from fish community probabilistic monitoring sites was implemented in 1997 but put on hold since 2004. Hold is partially due to human resources issues but also the need for this effort to take equal priority to other media collected in order to be successful (fish tissue collection was secondary and therefore not collected at all sampleable sites).

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

__X__ Total length
_____ Standard length
_____ Fork length
__X__ Weight
_____ Age
_____ Gender
_____ Reproductive condition
__X__ Lipid level or fat content (I consider this chemical information)
__X__ Other (please describe)? (percent moisture content)

8. What species of fish are collected? (Please check all that apply)

X Lake Trout	X Yellow Perch
___ Sicowet Lake Trout	X Smallmouth Bass
X Coho Salmon (GLNPO)	X Largemouth Bass
X Chinook Salmon (GLNPO)	X White perch
X Brown Trout	X Smelt
X Rainbow Trout	X Alewife
X Walleye	X Northern Pike
X Carp	X Other? (please list)

Note: Species collection depends on what the waterbody has to offer. We have data on more than 73 species of fish across the State and across the years. Our top species include common carp, channel catfish, largemouth bass, smallmouth bass, spotted bass, longear sunfish, bluegill, rock bass, redhorse spp. Walleye/sauger/saugeye, and flathead catfish.

9. What tissue is collected? (Please check all that apply)

- X Whole fish
- X Untrimmed fillet with skins (scaled species)
- ___ Trimmed fillet with skins (What do you consider trimmed?)
- X Untrimmed skinless fillets (smooth skinned species)
- ___ Trimmed skinless fillets (What do you consider trimmed?)
- ___ Dorsal plugs (please describe the length, width and weight)
- ___ Other? (please elaborate)

10. Are individual or composite samples analyzed? Both

X Individual fish or fish tissues are analyzed.

X Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

- X species
- ___ age
- X length
- ___ weight
- X collection date
- ___ sample volume
- ___ Other (please describe)

Our goal is to make composite samples of from 3 to 5 or more individual fish included in the composite. We will keep and analyze individual fish from sites if that is all the site will present us. This becomes especially true with upper predators. Because we are trying to cover large geographical areas,

waterbodies with multiple sites and multiple waterbodies we can only spend a limited amount of time sampling and then must move on. An individual fish, although not as desirable for an individual site, is very valuable in the realm of developing a data set over time, across basins, and within expansive stretches of large waterbodies such as the Wabash River.

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level (ug/kg)
X PCBs		
X Arochlors (spelled aroclor)	8082	50
X Congeners (special cases	1668	
ΣDDT		
X o,p' DDT	8081	5.0
X p,p' DDT	8081	5.0
X p,p' DDE	8081	5.0
X p,p' DDD (TDE)	8081	5.0
X Mirex	8081	5.0
Photomirex		
Σ Chlordane		
X *α*-chlordane	8081	2.5
X *γ*-chlordane	8081	2.5
X cis-nonachlor	8081	2.5
X trans-nonachlor	8081	5.0
X oxychlordane	8081	5.0
X Toxaphene	8081	250
X Aldrin	8081	2.5
X Dieldrin	8081	5.0
X Endrin	8081	5.0
Octachlorostryrene		
X Heptachlor epoxide	8081	2.5
BHC		
X α BHC	8081	2.5
X δ BHC	8081	2.5
X γ BHC	8081	2.5
X Other Chemicals? Please list.		
Endosulfan I	8081	2.5
Endosulfan II	8081	5.0

Endosulfan Sulfate	8081	5.0
Endrin Aldehyde	8081	5.0
Endrin Ketone	8081	5.0
Heptachlor	8081	2.5
Methoxychlor	8081	25.0
Pentachloroanisole	8081	2.5
Hexachlorobenzene	8081	2.5
Brominated Diphenyl Ethers	6014	sub ppb
Polycyclic Aromatic Hydrocarbons	8270C	1.7
Semivolatile Compounds	8270C	500+
Volatile Organic Compounds	8260B	5.0+
Metals on all samples		
Cadmium	6020	20
Lead	6020	70
Mercury	6020	50

Our lab has the capability of analyzing for a large list of metals.

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    30 grams

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply) It depends on what contaminants you are evaluating and how extensive your data set is.

    __X__ Fish collected from the same location
    __X__ Same species of fish collected
    __X__ Same size of fish collected
    _____ Same age of fish collected
    _____ Same sex of fish collected
    _____ Same collection time
    __X__ Lipid normalization (Only for trend/spatial and only with lipophilic compounds.)
    __X__ Others? (please elaborate) (dry weight normalization for Hg.)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    Organic carbon would be with a sediment sampling. Yes, we have the ability to analyze complimentary composite surficial sediment samples for the same BCCs we look for in the fish tissue samples.

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    Surficial aquatic sediments from same fish tissue collection reach. Although this has been traditionally part of the fish tissue monitoring program, in recent years it has been put on hold due to staffing resource shuffling.

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Officially NO. Although we will sit on some homogenates for a few years and have subjected some of these to comparative studies using new techniques we have no formal protocol for long term archiving. Both our lab and our contract lab have limited freezer space.

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Transformations include lipid or moisture normalization and graphing on a temporal scale with correlation coefficient. No other statistical are performed at this time. Running means may be evaluated along with site/species correlations.

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

    See above. What has not worked as well is looking as single species from singles sites across years. Of greater value is the pooling of larger data sets on a greater spatial scale.

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think

should be addressed by our analysis? If so, please list them and describe why you think they are important?

The primary purpose of the Indiana fish contaminants monitoring program is to support the issuance/update of fish consumption advisories for Indiana. The program design by necessity makes trend monitoring more problematic. Improved trend monitoring might be accomplished through a specialized probabilistic design utilizing a sentinel species (or functional feeding guild) for long term monitoring, stratified in such a way as to answer particular questions on a desired spatial and temporal scale. We had started collecting tissue from fish community probabilistic sites a number of years ago but that effort is currently on hold for a number of reasons.

In the current environment of 303(d) listing of impaired waters for non-support of Aquatic Life Uses for “fishable/swimmable” are being based on health information (i.e. the FCA). The emphasis of contaminant monitoring for spatial trends again is rendered secondary. The problem in 305(b) reporting and 303(d) listing is that the rules of assessment and interpretation for risk communication can change which is a policy issue. Perhaps when EPA gets away from FCAs driving fishable ALUS and moves to a contaminant level as a benchmark for this impairment it will help to guide states toward further development of acceptable trend monitoring effort in addition to monitoring for health advisory issuance(s).

Inter-tribal Fisheries and Assessment Program

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __X__ Edible-portion monitoring program
   _____ Other (please specify)

2. What are the explicit goals of your FCMP (or individual program element)?

   _____ Collection of data for issuing fish consumption advisories
   _____ Evaluation of trends of chemicals in the environment
   _____ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   ___x___ Others: Please elaborate.

   Sale of tribal commercial fish harvest.

3. How long has your program been in existence? ___15 years_____

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? _X_ Yes ___ No

   If you answered yes, when did these changes occur, what were these changes, and what efforts, if any, were made to make previous data compatible with past? As an example, we have included the following information from MDEQ's whole-fish trend monitoring program, but feel free to follow a different format if that works better for your program.

   Consumers of Great Lakes fish are advised by health authorities to prepare fish by removing excess fat and skin from fillets prior to cooking in order to reduce the amount of contaminants that may concentrate in the fatty portions of fish. Following these guidelines, ITFAP has modified its sample preparation to remove the skin before analysis. Prior to this change in procedure, ITFAP had requested that the skin be left on for analysis in order to be consistent with the State of Michigan's methodology. The purpose for testing skin-off fillets is to better reflect the amount of contaminants in an edible portion fillet. Several studies have shown that a reduction of PCBs by an average of 1/3 is achieved by removal of skin prior to analysis of a raw fillet (Zabik et al., 1993; Skea et al., 1979). Based on these results, PCB concentrations in the 2001 and 2004 results were adjusted in order to compare them to earlier analytical results from skin-on fillets.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   _X_ Great Lakes
   ___ Great Lakes connecting channels
   ___ Inland rivers
   ___ Inland lakes
   ___ Reservoirs or impoundments
   ___ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

   ___ Every year
   _X_ Fixed intervals (please describe)
   ___ Based on a randomized design
   ___ Case by case determination (if so, can you describe criteria)
   ___ Other (please describe)

   Lake Superior, Lake Huron and Lake Michigan on a rotating basis (eg. Lake Superior 2004, Lake Huron 2005, Lake Michigan 2006)

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

   _X_ Total length
   ___ Standard length
   ___ Fork length
   _X_ Weight
   _X_ Age
   _X_ Gender
   _X_ Reproductive condition
   _X_ Lipid level or fat content
   _X_ Other (please describe)

   Lamprey wounds, tags,

8. What species of fish are collected? (Please check all that apply)

X	Lake Trout	____	Smallmouth Bass
____	Sicowet Lake Trout	____	Largemouth Bass
____	Coho Salmon	____	White perch
____	Chinook Salmon	____	Smelt
____	Brown Trout	____	Alewife
____	Rainbow Trout	____	Northern Pike
X	Walleye	X	Other? (please list)
____	Carp		
____	Yellow Perch	Lake Whitefish	

9. What tissue is collected? (Please check all that apply)

____ Whole fish
____ Untrimmed fillet with skins
____ Trimmed fillet with skins
____ Untrimmed skinless fillets
X Trimmed skinless fillets
____ Dorsal plugs (please describe the length, width and weight)
____ Other?

10. Are individual or composite samples analyzed?

X Individual fish or fish tissues are analyzed.

____ Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

____ species
____ age
____ length
____ weight
____ collection date
____ sample volume
____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels? Same as Mike Whittle in the past – Environment Canada in the future?

Analyte	Analytical Method	Quantification Level
X PCBs		
X Aroclors		
X Congeners		
X ΣDDT		
X o,p' DDT		
X p,p' DDT		
X p,p' DDE		
X p,p' DDD (TDE)		
X Mirex		
X Photomirex		
X Σ Chlordane		
X *α*-chlordane		
X *γ*-chlordane		
X cis-nonachlor		
X trans-nonachlor		
X oxychlordane		
X Toxaphene		
X Aldrin		
X Dieldrin		
X Endrin		
X Octachlorostryrene		
X Heptachlor epoxide		
X BHC		
X α BHC		
X δ BHC		
X γ BHC		
X Other Chemicals? Please list. Mercury and others		

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    5 g

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

    __X__ Fish collected from the same location
    __X__ Same species of fish collected
    __X__ Same size of fish collected
    _____ Same age of fish collected
    _____ Same sex of fish collected
    __X__ Same collection time
    __X__ Lipid normalization
    _____ Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    No

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    No

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Yes

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Averages are illustrated in graphs – no statistical analyses have been performed but intend to complete in future.

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

    NA

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

    Definitely should be looking at storage, packaging, loss of moisture content, reduction in contaminants by removal of skin and fat. Studies have shown significant differences in samples due to fluid loss due to packaging, thawing, and length of time from collection to processing.

Minnesota Fish Contaminant Trend Monitoring Program

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __X__ Edible-portion monitoring program
   _____ Other (please specify)

2. What are the explicit goals of your FCMP (or individual program element)?

   __X__ Collection of data for issuing fish consumption advisories
   __X__ Evaluation of trends of chemicals in the environment
   __X__ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? 15 years

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? X Yes ___No

   Sampling None stated

   Analytical Changes in Laboratories:

   The majority of data from 1967 to 1989 were produced at the Minnesota Department of Health lab under the Pollution Control Agency program. This included mercury and PCB residue work and also some limited number of other heavy metals and organics analyses.
   The Minnesota DNR laboratory at Carlos Avery also did a fair amount of fish contaminant analysis, predominantly mercury residue work, in the 1970s.

   A local private laboratory (Braun Intertec) produced virtually all contaminant data for DNR from 1990 to 1998.

   The Minnesota Department of Agriculture lab took over all fish contaminant work in 1999 and continues to present.

   From 1967−1989, essentially the same analytical method for mercury (cold

vapor AA) was used by both state laboratories. Tissue types varied somewhat during those years. For much of the early mercury work in the 1970s muscle plugs without skin were analyzed; from roughly 1980 to the present, edible fillets have been predominantly used. Some attempts were made to compare mercury levels in these two tissue types, with fairly similar results. PCB analytical methods used were similar. Tissue types included both whole fish and edible fillets.

1990 to the present: In 1990, and again in 1998, when lab switches were made, attempts were made to establish data comparability by having both labs run numbers of split samples for mercury and PCBs.

1990: Department of Health laboratory and Braun Intertec laboratory each ran 30−40 split samples for mercury and PCBs. Mercury results compared very well, with somewhat more variation in PCB results. Both labs used essentially the same mercury cold-vapor method. Both labs used Aroclor® method for PCBs, but used a somewhat different set of peaks, which probably accounted for the slight differences in final results.

1998: Braun Intertec laboratory and Department of Agriculture laboratory each ran about 50 split samples for mercury and PCBs. Again, results showed good agreement on mercury levels, but not quite as good agreement on PCB results. Methods for both labs were essentially the same: cold-vapor for mercury, PCBs as Aroclor® (60/40 Aroclor® 1254/1260 mixture as calibration standard).

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   __X__ Great Lakes
   _____ Great Lakes connecting channels
   __X__ Inland rivers
   __X__ Inland lakes
   __X__ Reservoirs or impoundments
   _____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

   _____ Every year
   __X__ Fixed intervals (please describe)
   _____ Based on a randomized design *
   __X__ Case by case determination (if so, can you describe criteria)
   _____ Other (please describe)

   Fixed interval – every 5 years
   Other – one time events

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

__X__ Total length
_____ Standard length
_____ Fork length
__X__ Weight
__X__ Age (For some predator species)
_____ Gender
_____ Reproductive condition
_____ Lipid level or fat content)dropped this parameter in 2003)
_____ Other (please describe)

8. What species of fish are collected? (Please check all that apply)

_____ Lake Trout
__X__ Sicowet Lake Trout
__X__ Coho Salmon (GLNPO)
__X__ Chinook Salmon
_____ Brown Trout
_____ Rainbow Trout
__X__ Walleye
__X__ Carp
__X__ Yellow Perch
__X__ Smallmouth Bass
__X__ Largemouth Bass
_____ White perch
_____ Smelt
_____ Alewife
__X__ Northern Pike
_____ Other? (please list)

channel catfish, crappie, white sucker, bullheads, bluegill, buffalo, flathead catfish, sauger, white bass, fresh water drum

For the Screening Carp, walleye, northern pike

9. What tissue is collected? (Please check all that apply)

__X__ Whole fish
__X__ Untrimmed fillet with skins (scaled species)
_____ Trimmed fillet with skins (What do you consider trimmed?)
__X__ Untrimmed skinless fillets (smooth skinned species)
_____ Trimmed skinless fillets (What do you consider trimmed?)
_____ Dorsal plugs (please describe the length, width and weight)
_____ Other? (please elaborate)

Whole fish – screening
Untrimmed fillet with skins – for scaly fish
Untrimmed skinless fillets – for scalesless fish

10. Are individual or composite samples analyzed? Both

___X__Individual fish or fish tissues are analyzed.

___X__Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

___X___ species
___X___ age
___X___ length
___X___ weight
___X___ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level (ug/kg)
X PCBs		
X Arochlors (spelled aroclor)		
_____ Congeners (special cases		
_____ ΣDDT		
_____ o,p' DDT		
_____ p,p' DDT		
_____ p,p' DDE		
_____ p,p' DDD (TDE)		
_____ Mirex		
_____ Photomirex		
_____ Σ Chlordane		
_____ *α*-chlordane		
_____ *γ*-chlordane		
_____ cis-nonachlor		
_____ trans-nonachlor		
_____ oxychlordane		
_____ Toxaphene		
_____ Aldrin		
_____ Dieldrin		
_____ Endrin		
_____ Octachlorostryrene		
_____ Heptachlor epoxide		
_____ BHC		
_____ α BHC		
_____ δ BHC		
_____ γ BHC		
X Other Chemicals? Please list.		

Chemicals: mercury. *In the screening*: toxaphene, dioxin, polybrominated diphenyl ethers (PBDES), perfluorooctane sulfonate (PFOS), various household/industrial wastewater compounds

Methods:

PCBs (Aroclors®)- AOAC Method 970.52 for extraction of PCBs from fish tissue. EPA SW-846, Method 8082, *PCBs by Gas Chromatography*. 60/40 Aroclor® 1254/1260 mixture as the reference standard. Quantitation limit: around 0.010 mg/kg wet weight for most fish tissue.

Mercury - EPA Method 7473, Mercury in Solids by Thermal Decomposition Amalgamation and Atomic Absorption Spectrophotometry. Quantitation limit: ~0.010 mg/kg wet weight for most fish tissue.

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply) It depends on what contaminants you are evaluating and how extensive your data set is.

__X__ Fish collected from the same location
__X__ Same species of fish collected
__X__ Same size of fish collected
_____ Same age of fish collected
_____ Same sex of fish collected
__X__ Same collection time
_____ Lipid normalization
__X__ Others? (please elaborate)

Collection time – plus or minus a few weeks
Other – similar number of fish collected

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

Water chemistry parameters

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    Water column during screening
    Sediments during screening

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    One year, some long term

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Trends analysis is primarily being done by Bruce Monson of Minnesota Pollution Control Agency

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

Background and Instructions:

The intent of this questionnaire is to learn more about the current protocols for collection and analysis of fish tissue used by your Fish Contaminant Monitoring Program (FCMP) and techniques used by your agency to determine spatial and temporal trends of contaminants in fish from all Great Lakes. This survey builds upon an MDEQ survey sent around in previous years. Please fill out the survey or update your previous responses. Summary results will be disseminated and shared as a way to describe differences in techniques among participating agencies. The questionnaire is divided into four parts:

I. Program Description
II. Program Logistics
III. Quality Control, Data Analysis, and Interpretation of Trends
IV. Conclusion and Summaries

In some cases, the FCMPs include several elements with different goals and designs (e.g., edible portion, young-of-year (YOY), or whole adult fish). If your program has multiple elements, then it would be helpful to the Interlaboratory Comparison Study if the questions were answered separately for each element. We have provided three copies of the questionnaire for this purpose. We have also provided the entire questionnaire and your previous answers on CD should you wish to respond electronically. Please feel free to append reports or other written materials when you feel that they will answer questions posed below.

Please send survey responses, reports, or other written materials to Beth Murphy at:

murphy.elizabeth@epa.gvo

Or

U.S. Environmental Protection Agency
Great Lakes National Program Office
MC 17J
77 W. Jackson Blvd.
Chicago, IL 60604

If you would like additional information about the questionnaire or the project, please contact Beth. Murphy at 312-353-4227 or Michael Whittle at 905-336-4565. We would appreciate receiving your responses by February 1, 2006. . Thank you in advance for your assistance.

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __x__ Edible-portion monitoring program
   _____ Other (please specify)

   Please attach a description of each element to this questionnaire. Additionally, if your program includes different elements, please answer questions 2 through 25 for each element.

2. What are the explicit goals of your FCMP (or individual program element)?

   _x_____ Collection of data for issuing fish consumption advisories
   _____ Evaluation of trends of chemicals in the environment
   _x_____ Evaluation of effectiveness of pollution control activities
   _x_____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? _____

   Informally since 1983, formally since 1992.

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? ___Yes x___No

If you answered yes, when did these changes occur, what were these changes, and what efforts, if any, were made to make previous data compatible with past? As an example, we have included the following information from MDEQ's whole-fish trend monitoring program, but feel free to follow a different format if that works better for your program.

FCMP Element	Date (Initiation or Change)	Description (brief description of program or change)
Whole fish trend monitoring	2001	Added Hg to GLFMP's routine analyte list.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

___x___ Great Lakes
_____ Great Lakes connecting channels
___x___ Inland rivers
___x___Inland lakes
___x___ Reservoirs or impoundments
_____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

_____ Every year
_____ Fixed intervals (please describe)
_____ Based on a randomized design
___x___ Case by case determination (if so, can you describe criteria)
_____ Other (please describe)

We return to locations based on our TMDL determinations, or when our data indicate we need to return due to our data becoming historical (>10 years old).

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

___x___ Total length
_____ Standard length
_____ Fork length
___x___ Weight
_____ Age
_____ Gender
_____ Reproductive condition
___x___ Lipid level or fat content
_____ Other (please describe)?

8. What species of fish are collected? (Please check all that apply)

_____ Lake Trout
_____ Sicowet Lake Trout
_____ Coho Salmon
_____ Chinook Salmon
_____ Brown Trout
___x___ Rainbow Trout
___x___ Walleye
___x___ Carp
___x___ Yellow Perch
___x___ Smallmouth Bass
___x___ Largemouth Bass
_____ White perch
_____ Smelt
_____ Alewife
___x___ Northern Pike
_____ Other? (please list)

Anything of edible size that we can collect that someone might feasibly consume as available, but the above marked fish are most common.

9. What tissue is collected? (Please check all that apply)

___x___ Whole fish
___x___ Untrimmed fillet with skins
_____ Trimmed fillet with skins
___x___ Untrimmed skinless fillets
_____ Trimmed skinless fillets
_____ Dorsal plugs (please describe the length, width and weight)

Depends on the type of fish and why we want them.
_____ Other? (please elaborate)

10. Are individual or composite samples analyzed?

___x___Individual fish or fish tissues are analyzed.

___x___Tissue from more than one fish is combined into a composite sample.

It depends on the availability of the species within the water body.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

___x___ species
_____ age
___x___ length
_____ weight
___x___ collection date
___x___ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level
x PCBs		
x Arochlors		
Congeners		
ΣDDT		
o,p' DDT		
x p,p' DDT		
x p,p' DDE		
x p,p' DDD (TDE)		
x Mirex		
Photomirex		
Σ Chlordane		
x *α*-chlordane		
x *γ*-chlordane		
x cis-nonachlor		
x trans-nonachlor		
x oxychlordane		
Toxaphene		
x Aldrin		
x Dieldrin		
x Endrin		
Octachlorostryrene		
x Heptachlor epoxide		
BHC		
x α BHC		
x δ BHC		
x γ BHC		
x Other Chemicals? Please list.		
hexachlorobenzene		

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    150 grams

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

    x Fish collected from the same location
    x Same species of fish collected
    _____ Same size of fish collected
    _____ Same age of fish collected
    _____ Same sex of fish collected
    _____ Same collection time
    _____ Lipid normalization
    _____ Others? (please elaborate)

    We try not to use our data for trends, but when we must we heavily caveat it and state all potential confounding factors.

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

No.

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

We sometimes collect sediment data along with fish data.

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

No.

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

In the past, we've graphed results of a species from a water body over time for a particular contaminant.

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

We don't collect data to monitor trends, but it sometimes does get used that way. Because we don't collect the same fish from the same location year after year, there are often large time gaps or collection location gaps in our data that render statistically valid trend determinations impossible.

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

No.

Thanks again for your time and effort on these questions.

Ministry of the Environment Fish Contaminant Monitoring Program

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   __X__ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __X__ Edible-portion monitoring program
   _____ Other (please specify)

2. What are the explicit goals of your FCMP (or individual program element)?

   __X__ Collection of data for issuing fish consumption advisories
   __X__ Evaluation of trends of chemicals in the environment
   __X__ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? 30 years

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? X Yes ___No

   Sampling None stated

   Analytical In 1997, photomirex was added to the list of contaminants analyzed; in 2000, dioxin-like PCBs were added to the analysis; in 2001, there was a reduction in the toxaphene detection limit; in 2002, additional chlordane congeners were analyzed.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   __X__ Great Lakes
   __X__ Great Lakes connecting channels
   __X__ Inland rivers
   __X__ Inland lakes
   __X__ Reservoirs or impoundments
   _____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

_____ Every year
_____ Fixed intervals (please describe)
_____ Based on a randomized design
_____ Case by case determination (if so, can you describe criteria)
__X__ Other (please describe)

When possible

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

__X__ Total length
_____ Standard length
_____ Fork length
__X__ Weight
_____ Age
__X__ Gender
_____ Reproductive condition
__X__ Lipid level or fat content
_____ Other (please describe)?

8. What species of fish are collected? (Please check all that apply)

__X__ Lake Trout
__X__ Sicowet Lake Trout
__X__ Coho Salmon
__X__ Chinook Salmon
__X__ Brown Trout
__X__ Rainbow Trout
__X__ Walleye
__X__ Carp
__X__ Yellow Perch
__X__ Smallmouth Bass
__X__ Largemouth Bass
__X__ White perch
__X__ Smelt
__X__ Alewife
__X__ Northern Pike
__X__ Other? (please list)

Channel catfish, crappie, whitefish

9. What tissue is collected? (Please check all that apply)

__X__ Whole fish
_____ Untrimmed fillet with skins
_____ Trimmed fillet with skins
_____ Untrimmed skinless fillets
_____ Trimmed skinless fillets
__X__ Dorsal plugs (please describe the length, width and weight)
_____ Other? (please elaborate)

Whole Fish – Young of the Year samples

10. Are individual or composite samples analyzed?

___X__Individual fish or fish tissues are analyzed.

___X__issue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

___X___ species
___X___ age
___X___ length
___X___ weight
___X___ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level
X PCBs		
X Arochlors		
X Congeners		
X ΣDDT		
X o,p' DDT		
X p,p' DDT		
X p,p' DDE		
X p,p' DDD (TDE)		
X Mirex		
X Photomirex		
X Σ Chlordane		
X *α*-chlordane		
X *γ*-chlordane		
X cis-nonachlor		
X trans-nonachlor		
X oxychlordane		
X Toxaphene		
X Aldrin		
X Dieldrin		
X Endrin		
X Octachlorostryrene		
X Heptachlor epoxide		
X BHC		
X α BHC		
X δ BHC		
X γ BHC		
X Other Chemicals? Please list.		
Mercury		

PCBs (Arochlors) - GC/ECD analysis (quantitation limit = 0.02 mg/kg)

PCB (congeners) - GC/ECD analysis (quantitation limit = 0.001 mg/kg)

DDT, DDD - GC/ECD analysis (quantitation limit = 0.005 mg/kg)

DDD - GC/ECD analysis (quantitation limit = 0.001 mg/kg)

Mercury - Method not reported, quantitation limit = 0.01 mg/kg

α-chlordane, γ-chlordane, cisnonachlor, trans-nonachlor, oxychlordane - GC/ECD analysis (quantitation limit = 0.002 mg/kg)

Toxaphene, dieldrin/ endrin - GC/ECD analysis (quantitation limit = 0.05

mg/kg)

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    Contaminant specific

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

    __X__ Fish collected from the same location
    __X__ Same species of fish collected
    __X__ Same size of fish collected
    __X__ Same age of fish collected
    __X__ Same sex of fish collected
    __X__ Same collection time
    __X__ Lipid normalization
    _____ Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    No

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    Prey fish

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    No

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Regression – standard lengths
    Other - ANOVA

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

Thanks again for your time and effort on these questions.

Pennsylvania Fish Contaminant Monitoring Program

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __X__ Edible-portion monitoring program
   ___X___ Other (please specify)

   American eel – Composite of 5 one inch skinless sections from ach fish. Bones are included

2. What are the explicit goals of your FCMP (or individual program element)?

   __X___ Collection of data for issuing fish consumption advisories
   _____ Evaluation of trends of chemicals in the environment
   _____ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? __27 YEARS___

   Routine monitoring for contaminants in fish began in 1979.

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? __X_____Yes _____No

   Sampling - Sampling of both whole fish (as prescribed in the EPA Core program) and the edible portion (FDA standard fillets) began in 1983 at half of the 36 Core stations. In 1988 sampling of the edible portion began almost exclusively to determine the need for consumption advisories. In addition, sampling was no longer limited to the original 36 stations. The tissue monitoring is rotated through the entire ambient monitoring network on a 5-year basis, in order to follow up on existing advisories and allow the field biologists to recommend sampling in areas of concern in their geographic area of responsibility.

   Analytical The methodologies utilized for the determination of the organic parameters have evolved in the period since 1983. The final determinative step's

type of hardware, GC-ECD (Gas Chromatograph – Electron Capture Detector), has remained constant, though there have been significant improvements in performance with newer hardware. Packed column isothermal operation has given way to capillary columns with temperature programming. These improvements have lead to significant improvements in both qualitative determination and reductions in detection limits. The sample preparation process has also undergone improvements over this period. The original methodology, based on an FDA (Food and Drug Administration) method involved high speed blending of the tissue with a solvent and filtering out the solid material. The resulting solution was then cleaned up with macro column chromatography using solid absorbents. In 1991 a modified USEPA (U.S. Environmental Protection Agency) method, a 16-hour soxhlet extraction process followed by GPC (Gel Permeation Chromatography) and SPE (Solid Phase Extraction) cleanup techniques, replaced the previous extraction process. The resulting process was faster, used less solvent, had higher precision and was as accurate as the previous method. In 1994, after 2 years of development, the EPA methodology was replaced with an in house extraction method that was equivalent in performance. This method, presented at the 1993 Pittsburgh Conference, was a Supercritical Extraction process with integral cleanup. The resulting method used almost no solvent and provided cleaner extracts. This technology is still in use by the laboratory.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   __X__ Great Lakes
   _____ Great Lakes connecting channels
   __X__ Inland rivers
   __X__ Inland lakes
   __X__ Reservoirs or impoundments
   __X__ Other (please describe)

   Pennsylvania Fish & Boat Commission trout hatcheries

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

   _____ Every year
   __X__ Fixed intervals (please describe)
   _____ Based on a randomized design
   __X__ Case by case determination (if so, can you describe criteria) – we do not do any randomized sampling – re-sampling on sites not on the 5 year rotation are only sampled upon request
   __X__ Other (please describe)

   Fixed intervals – every 5 years

7. What are the key factors that your agency consideres when selecting the waterbodies, fish species, chemicals, and tissue types to be investigated each year? Has this decision-making process been documented in a written format? Please describe how this decision-making process is implemented each year.

Part II. Program Logistics and Mechanics

8. What non-chemical information is collected about the fish? (Please check all that apply)

__X__ Total length
_____ Standard length
_____ Fork length
__X__ Weight
_____ Age
__X__ Gender (on Lake Erie steelhead / coho samples)
__X__ Reproductive condition
__X__ Lipid level or fat content
__X__ Other (please describe)?

Other – Moisture content (metals analysis)
Other – Comments on condition

9. What species of fish are collected? (Please check all that apply)

__X__ Lake Trout
_____ Sicowet Lake Trout
__X__ Coho Salmon
_____ Chinook Salmon
__X__ Brown Trout
__X__ Rainbow Trout
__X__ Walleye
__X__ Carp
__X__ Yellow Perch
__X__ Smallmouth Bass
__X__ Largemouth Bass
__X__ White perch
_____ Smelt
_____ Alewife
__X__ Northern Pike
_____ Other? (please list)

Brook trout, yellow bullhead, brown bullhead, flathead catfish, white sucker, muskellunge, American eel, sauger, white catfish, burbot, freshwater drum, silver redhorse

10. What tissue is collected? (Please check all that apply)

_____ Whole fish
__X__ Untrimmed fillet with skins
_____ Trimmed fillet with skins
__X__ Untrimmed skinless fillets
_____ Trimmed skinless fillets
_____ Dorsal plugs (please describe the length, width and weight)

__X__ Other? (please elaborate)

Untrimmed fillet with skins – belly flap
Untrimmed skinless fillets – catfish
Other – eel skinless, gutted X section

11. Are individual or composite samples analyzed?

_____Individual fish or fish tissues are analyzed.

__X__Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

__X__ species
_____ age
__X__ length
_____ weight
__X__ collection date
_____ sample volume
_____ Other (please describe)

12. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level
X PCBs		
X Arochlors		
_____ Congeners		
_____ DDT		
X op'DDT		
X pp'DDT		
X p,p'DDE		
X p,p' DDD (TDE)		
X Mirex / photomirex		
_____ Chlordane		
X *a*-chlordane		
X *γ*-chlordane		
X cis-nonachlor		
X trans-nonachlor		
X oxychlordane		
_____ Toxaphene		
X Aldrin		
X Dieldrin/Endrin		
_____ Octachlorostryrene		
X Heptachlor epoxide		
X BHC		
X α BHC		
X δ BHC		

X Other Chemicals? Please list.

Methoxychlor, chlordane, heptachlor, lindane, kepone, lead, copper, chromium, cadmium

Methods:

PCBs (Arochlors) - Nominal reporting levels for all Aroclors® are 0.050 mg/kg based on wet weight. The methodology employed for extraction is a superficial

fluid extraction (SFE) utilizing CO2, similar to EPA Method 3561, which incorporates a lipid removal process as part of the extraction. This method was detailed in a paper presented at the "Pittsburgh Conference of Analytical Chemistry and Applied Spectroscopy" in March 1995. The determinative steps are modifications of EPA Method 8082

DDT, DDE, DDD, α-chlordane, γ-chlordane, cis-nonachlor, transnonachlor, oxychlordane, dieldrin/ endrin, BHC, and other organic compounds - Nominal reporting levels of 0.004 mg/kg based on wet weight, with the assumption that there are not any PCB interferences. The methodology employed for extraction is an SFE utilizing CO2, similar to EPA Method 3561, which incorporates a lipid removal process as part of the extraction. This method was detailed in a paper presented at the "Pittsburgh Conference of Analytical Chemistry and Applied Spectroscopy" in March 1995. The determinative steps are modifications of EPA Method 8081.

Mercury - EPA Method 245.1 quantitation limit = 0.02 mg/kg

Lead - EPA Method 200.8, quantitation limit=0.025 mg/kg

Copper - EPA Method 200.8 quantitation limit=0.10 mg/kg

Chromium - EPA Method 200.7, quantitation limit=0.10 mg/kg

Cadmium - EPA Method 200.8, quantitation limit=0.005 mg/kg

13. What is the minimum amout of homogenate needed to conduct analysis for your laboratory?

In theory we could complete an organic analysis with as little as 10 grams of tissue. But from a practical point of view that small of a sample would be difficult to homogenize and there would not be any tissue left to do re-runs or QCs. It is generally better if we have a minimum of 200 grams of tissue.

Part III. Quality Control, Data Analysis, and Interpretation of Trends

14. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

__X__ Fish collected from the same location
__X__ Same species of fish collected
_____ Same size of fish collected
_____ Same age of fish collected
_____ Same sex of fish collected
_____ Same collection time
_____ Lipid normalization

_____Others? (please elaborate)

15. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    NO

16. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    NO

17. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Pennsylvania does not retain tissue for more than a year and extracts are not retained for more than a few weeks after analytical work is completed.

18. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Regression – limited
    Other – simple perusal of data

19. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

    WE HAVE NOT LOOKED AT TRENDS

Part IV. Conclusion and Summary

20. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

Wisconsin Fish Contaminant Monitoring Program

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   __X__ Whole adult fish trend monitoring program (on a limited basis)
   __X__ Young-of-year (YOY) trend monitoring program (limited specially funded for 5 years for Hg only)
   __X__ Caged-organism monitoring program (Rarely anymore but database contains some caged fish data)
   __X__ Edible-portion monitoring program (for fish consumption advice and success of remediation)
   ____x__ Other (please specify)

   Special monitoring occasionally at specific sites to answer specific questions typically of limited duration. There is some limited data for snapping turtles and invertebrates, and for fish feed used and products produced by our state fish hatcheries.

   The primary element of Wisconsin's program is fish consumption advice and success of remediation. Other elements are limited or short term.

2. What are the explicit goals of your FCMP (or individual program element)?

   ___x___ Collection of data for issuing fish consumption advisories
   ___x___ Evaluation of trends of chemicals in the environment
   ___x___ Evaluation of effectiveness of pollution control activities
   ___x___ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? ___35____

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? _x_ Yes ___ No

   The state of Wisconsin has monitored chemicals in fish since the 1970s. The objective of the Wisconsin FCMP is primarily to collect data for fish consumption advisories. Thus, the major component of the monitoring program concerns collection and analysis of edible fish tissue.

   Selection of sampling sites depends on a number of factors, such as size of the water body, the ease of access, and the amount of fishing activity. The focus of the sampling has changed over the years:

   Prior to 1990 - a site-by-site selection of water bodies based on suspected problems in the first years,

   1990-2000 - basin assessment approach where the goal was to return to a basin every five years and where specific problem sites within a basin would be targetted for repeated sampling.

   2000 to now - baseline assessment adopted for fish community, habitat, and macroinvertebrate community monitoring. The goal of this is a statewide coverage, in addition to the sampling of advisory sites occurring every five years.

   The SLOH quantifies total PCBs by GC/ECD after clean-up by gel permeation(EPA method 3630C) and silica gel column chromatography. Certified Aroclor standards are used to quantify Aroclors. The Mullins mix of Aroclors is used for congeners as defined by Ribbick et al, 1982. The methods are described in the Wisconsin State Laboratory of Hygiene (August 1, 2003. Section -- 1440 PCB Analysis in Tissue. Revision 3.1 August 1, 2003 - present). The methods reference:

   A. Ribick, M., Petty and Stalling, 1982. "Toxaphene Residues in Fish: Identification, Quantification and Confirmation at Part per Billion Level." Environmental Science and Technology, 16, 310-318.

   B. "Silica Gel Cleanup", EPA Method 3630C, (Revision 2, December, 1996.

   C. "Gel-Permeation Cleanup", EPA Method 3640A,(Revision 1, September, 1994.

   The method reference is (partially): Sullivan and Delfino. 1982. Jo of Env. Science and Health.

   For dioxin and furan congeners, we contract out to laboratories by bid. Method specified is 1613B. Detection limit varies with the congener and is too complicated to list here.

For mercury analysis, the method is cold vapor atomic absorption spectrophotometry (USEPA Method 1631). The LOD was 0.004 ug/g in recent years. Mercury in fish is analyzed by the WI SLOH. The oldest mercury fish result I can find shows we had a reporting limit of 0.03 ug/g on 9/29/87. The LOD of 0.004 ug/g started on 6/9/94.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

___x___ Great Lakes
_____ Great Lakes connecting channels
___x___ Inland rivers
___x___ Inland lakes
___x___ Reservoirs or impoundments
___x___ Other (please describe)

There is some limited data fish feed used and products produced by our state fish hatcheries.

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

_____ Every year
___x___ Fixed intervals (please describe)
_____ Based on a randomized design
___x___ Case by case determination (if so, can you describe criteria)
___x___ Other (please describe)

Schedule varies by pollutant and waterbody type. For inland PCB advisory sites, the goal is to resample every 5 years. For mercury advisory sites, the goal is to resample every 15 years. For inland lakes previously sampled for and with higher mercury concentrations, the goal is to resample every 15 years. For Great Lakes (PCB), the goal is to resample every other year. For inland lakes that have not been sampled, the goal is to sample lakes over 100 acres at least once over the next 15 years.

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

___x___ Total length
_____ Standard length
_____ Fork length
___x___ Weight
___X___ Age (selected)
___X___ Gender (if apparent)
_____ Reproductive condition
___X___ Lipid level or fat content (only for samples analyzed for organic chemicals)
_____ Other (please describe)?

8. What species of fish are collected? (Please check all that apply)

___X___ Lake Trout
___X___ Siscowet Lake Trout
___X___ Coho Salmon
___X___ Chinook Salmon
___X___ Brown Trout
___X___ Rainbow Trout
___X___ Walleye
___X___ Carp
___X___ Yellow Perch
___X___ Smallmouth Bass
___X___ Largemouth Bass
___X___ White perch
___X___ Smelt
___X___ Alewife
___X___ Northern Pike

___X___ Other? (please list) including bluegills; pumpkinseed; green sunfish; black and white crappie; channel and flathead catfish; black, brown, and yellow bullheads; lake sturgeon; white sucker; durm, burbot, sauger, white bass; rock bass; brook trout; white perch; muskellunge; greater, northern, silver, golden redhorse; smallmouth and largemouth buffalo

9. What tissue is collected? (Please check all that apply)

___X___ Whole fish
___X___ Untrimmed fillet with skins
_____ Trimmed fillet with skins
___X___ Untrimmed skinless fillets
_____ Trimmed skinless fillets
_____ Dorsal plugs (please describe the length, width and weight)
___X___ Other? (please elaborate)

edible portions or steaks for species like lake sturgeon and sometime muskies where the fish is large and the entire fillet is unwieldy.

10. Are individual or composite samples analyzed?

___X__Individual fish or fish tissues are analyzed.

___X__Tissue from more than one fish is combined into a composite sample. (sometimes)

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

___X___ species
_____ age
___X___ length
_____ weight
___X___ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level
X PCBs		
X Arochlors	epa3630c, 3640a	0.040 ug/g
X Congeners		
ΣDDT		
X o,p' DDT		
X p,p' DDT		0.04 ug/g
X p,p' DDE		0.03 ug/g
X p,p' DDD (TDE)		0.040ug/g
Mirex		
Photomirex		
Σ Chlordane		
X (CIS chlordane) *α*-chlordane		0.02 ug/g
X (TRANS chlordane) *γ*-chlordane		0.02 ug/g
X cis-nonachlor		0.02 ug/g
X trans-nonachlor		0.02 ug/g
Oxychlordane		
Toxaphene		
Aldrin		
X Dieldrin		0.020 ug/g
X Endrin		0.02 ug/g
Octachlorostryrene		
Heptachlor epoxide		
BHC		
α BHC		
δ BHC		
γ BHC		

x Other Chemicals? Please list.

O,p-dde LOD=0.030ug/g o,p-ddd LOD=0.040 ug/g
Mercury (cold vapor atomic absorption spectrophotometry (USEPA Method 1631), LOD = 0.004 ug/g), dioxin and furan 2,3,7,8-substituted congners and at times or in the past other metals and organic chemicals. Also, 11 PBDEs congeners

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    Minimum is 25 grams for organics and 10 grams for inorganics

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

    __X__ Fish collected from the same location
    __X__ Same species of fish collected
    __X__ Same size of fish collected (some samples)
    _____ Same age of fish collected
    _____ Same sex of fish collected
    __X__ Same collection time (general season, some analyses)
    _____ Lipid normalization
    _____ Others? (please elaborate)

    For temporal and spatial analyses, we tend to use statistical methods that assess the significance and adjusts for the confounding factors rather than trying to control for some of the factors known to affect contaminant accumulation at the sampling end. Typically, continuous confounding factors like length (or age or weight or autocorrelated with each other) and or fat are treated as a co-variable in an analysis. For season and sex, the significance can be examined as a classification factor in analysis of variance procedures. It is important to test for significance of interactions between the factors.

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    The primarily purpose of Wisconsin's fish contaminant monitoring is to determining appropriate fish consumption advice. In order to use fish contaminant data for other purposes, data for other variable may be beneficial but are not always available. Some of these variables are available through other monitoring programs.

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    Data may be available for other media through other programs e.g. remediation sites (e.g. Fox River, Sheboygan River, etc.).

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Only for about 50 samples each year on an ad hoc, case by case basis.

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Temporal trends are not evaluated as a part of issuing fish consumption advice. Temporal trends would be evaluated using a special dataset, using special statistical procedures, etc. For consumption advice, the more recent years (about 5 to 10 for PCBs and 10 to 15 for mercury) are used. Changes are evaluated by examining the strength of the data but this is not an analysis to determine if concentrations have changed significantly over time. See response to question 13.

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

    What has worked well for detecting trends over space and season is to develop a monitoring design specific to the question, issue, location and using statistical methods that are appropriate. Use of data collected for other purposes doesn't work well because data on variable are typically missing.

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

    This survey seems to be focused on trends rather than on the methods used to issue fish consumption advice. There are not questions evaluating methods to analyze data for fish consumption advice which is the primary purpose of Wisconsin's fish contaminant monitoring program.

Thanks again for your time and effort on these questions.

New York Fish Contaminant Monitoring Program

Lake Ontario Contaminant Trend Surveillance Program (LOCTSP)

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __X__ Edible-portion monitoring program
   _____ Other (please specify)

   Lake Ontario Contaminant Trend Surveillance Program

2. What are the explicit goals of your FCMP (or individual program element)?

   __X___ Collection of data for issuing fish consumption advisories
   ____X__ Evaluation of trends of chemicals in the environment
   ____X__ Evaluation of effectiveness of pollution control activities (an off shoot)
   ____X__ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? __30 Years____

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? _X_Yes ___No

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   __X__ Great Lakes – Lake Ontario
   _____ Great Lakes connecting channels
   _____ Inland rivers
   _____Inland lakes
   _____ Reservoirs or impoundments
   _____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

   _____ Every year
   _____ Fixed intervals (please describe)
   _____ Based on a randomized design
   __X__ Case by case determination (if so, can you describe criteria)
   __X__ Other (please describe)

   Project was originally designed for biennial sample collection. Availability of funds and competing projects have forced the use of other intervals that are not consistent.

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

   __X__ Total length
   _____ Standard length
   _____ Fork length
   __X__ Weight
   __X__ Age
   _____ Gender
   _____ Reproductive condition
   __X__ Lipid level or fat content
   __X__ Other (please describe)?

   Percent moisture

8. What species of fish are collected? (Please check all that apply)

   __X__ Lake Trout
   _____ Sicowet Lake Trout
   __X__ Coho Salmon
   __X__ Chinook Salmon
   __X__ Brown Trout
   __X__ Rainbow Trout
   _____ Walleye
   _____ Carp
   _____ Yellow Perch
   _____ Smallmouth Bass
   _____ Largemouth Bass
   _____ White perch
   _____ Smelt
   _____ Alewife
   _____ Northern Pike
   _____ Other? (please list)

9. What tissue is collected? (Please check all that apply)

_____ Whole fish
__X__ Untrimmed fillet with skins (with out scales)
_____ Trimmed fillet with skins
_____ Untrimmed skinless fillets
_____ Trimmed skinless fillets
_____ Dorsal plugs (please describe the length, width and weight)

__X__ Other? (please elaborate)

Age 3+ lake trout analyzed as whole fish; all other lake trout (older fish) are prepared as first noted above.

10. Are individual or composite samples analyzed?

__X__ Individual fish or fish tissues are analyzed.

_____ Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

_____ species
_____ age
_____ length
_____ weight
_____ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level (ng/g)
X PCBs		
X Arochlors		20
Congeners		
ΣDDT		
o,p' DDT		
X p,p' DDT		2
X p,p' DDE		2
X p,p' DDD (TDE)		2
X Mirex		2
X Photomirex		5
Σ Chlordane		
X *α*-chlordane		5
X *γ*-chlordane		5
X cis-nonachlor		5
X trans-nonachlor		5
X oxychlordane		5
Toxaphene		
Aldrin		
X Dieldrin		5
Endrin		
Octachlorostryrene		
X Heptachlor epoxide		5
BHC		
α BHC		
δ BHC		
γ BHC		
X Other Chemicals? Please list.		
Mercury	EPA Method 245.6	6
HCB	See attached Method	2

See attached method – based on FDA's pesticide analytical manual

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

10 g for PCB/ OC
1 g for Hg

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

__X__ Fish collected from the same location
__X__ Same species of fish collected
_____ Same size of fish collected
__X__ Same age of fish collected
_____ Same sex of fish collected
__X__ Same collection time
__X__ Lipid normalization (optional)
_____ Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

No

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

No

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

No

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

Graphics, Kruskal Wallis

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

Expansion into other xenobiotics is a must, but funding for contractual analytical services is lacking. With the heave involvement in many studies on how sites (including Hudson River), there is an insufficient amount of time (staff resources) to effectively look at Great Lakes data. I know we are missing availability to make positive statements about what is occurring.

Thanks again for your time and effort on these questions.

Note: Smallmouth bass have been taken in recent years to examine the impact of dietary change (ex. Round goby) on contaminant levels. However, we are behind where we should be on this work.

New York Fish Contaminant Monitoring Program

Young of the Year Program

Fish Contaminant Monitoring Program Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   __X__ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   _____ Edible-portion monitoring program
   _____ Other (please specify)

   Lake Ontario Contaminant Trend Surveillance Program

2. What are the explicit goals of your FCMP (or individual program element)?

   _____ Collection of data for issuing fish consumption advisories
   ____X__ Evaluation of trends of chemicals in the environment
   ____X__ Evaluation of effectiveness of pollution control activities (an off shoot)
   ____X__ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   _____ Others: Please elaborate

3. How long has your program been in existence? __22 Years____

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? _X_Yes ___No

   Sampling The number of stations increased with time, until 2003 when reduced to 11 stations due to reduced funding.

   Analytical The number of chemicals analyzed has changed over time (PAHs were only analyzed in 1992, dioxins/furans were added to the list in 1992, PCB congeners were added in 1997). Once added, the same methods were retained for these analytes if analyzed in the future.

   For collections taken in 1984 thru 1997, all chemical analysee were conducted at the Department's Hale Creek Field Station. The 2003 samples were analyzed at EnChem, A Division of Pace Analytical Analytical Services Inc. Differences in analytical data were evident. The changes are being evaluated. 2003 Collections reflect a six year interval, caused by lack of funds for 2002.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   __X__ Great Lakes – Lake Ontario
   __X__ Great Lakes connecting channels
   _____ Inland rivers
   _____Inland lakes
   _____ Reservoirs or impoundments
   _____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

   _____ Every year
   __X__ Fixed intervals (please describe)
   _____ Based on a randomized design
   _____ Case by case determination (if so, can you describe criteria)
   _____ Other (please describe)

   Fixed interval – every 5 years

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

   __X__ Total length
   _____ Standard length
   _____ Fork length
   __X__ Weight
   __X__ Age
   _____ Gender
   _____ Reproductive condition
   __X__ Lipid level or fat content
   __X__ Other (please describe)?

   Percent moisture

8. What species of fish are collected? (Please check all that apply)

   _____ Lake Trout
   _____ Sicowet Lake Trout
   _____ Coho Salmon
   _____ Chinook Salmon
   _____ Brown Trout
   _____ Rainbow Trout
   _____ Walleye
   _____ Carp
   _____ Yellow Perch
   _____ Smallmouth Bass
   _____ Largemouth Bass
   _____ White perch
   _____ Smelt
   _____ Alewife
   _____ Northern Pike
   _____ Other? (please list)

   Bluntnose minnow, spottail shiner, emerald shiner

9. What tissue is collected? (Please check all that apply)

___X___ Whole fish
_____ Untrimmed fillet with skins (with out scales)
_____ Trimmed fillet with skins
_____ Untrimmed skinless fillets
_____ Trimmed skinless fillets
_____ Dorsal plugs (please describe the length, width and weight)

_____ Other? (please elaborate)

10. Are individual or composite samples analyzed?

_____Individual fish or fish tissues are analyzed.

___X__Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

___X___ species
___X___ age
_____ length
_____ weight
___X___ collection date
___X___ sample volume
_____ Other (please describe)

Collection date – 1 time collection/site
Sample volume – sample mass

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level (ng/g)
X PCBs		
X Arochlors		
Congeners		
ΣDDT		
o,p' DDT		
X p,p' DDT		
X p,p' DDE		
X p,p' DDD (TDE)		
X Mirex		
X Photomirex		
Σ Chlordane		
X *α*-chlordane		
X *γ*-chlordane		
X cis-nonachlor		
X trans-nonachlor		
X oxychlordane		
Toxaphene		
Aldrin		
X Dieldrin		
Endrin		
Octachlorostryrene		
X Heptachlor epoxide		
BHC		
α BHC		
δ BHC		
γ BHC		
X Other Chemicals? Please list.		

Mercury, PAHs, Chlorinated Dioxins/Furans, Cadmium, Lipid

Methods:

PCBs (Aroclors) - Modified EPA 8080 (quantitation limit = 0.05 mg/kg)

PCBs (congeners) - ITS Environmental SOP

PAHs - Modified EPA 8310 (quantitation limit = 0.05 mg/kg)

Chlorinated Dioxins/Furans - EPA 8280/8290 (quantitation limit = 0.000001 mg/kg)

Mercury - Modified EPA 7470 (quantitation limit = 0.05 mg/kg)

Cadmium - Modified EPA 7131 (quantitation limit = 0.05 mg/kg)

Lipid - En Chem SOP (quantitation limit = 0.01 percent)

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    2 grams

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

    __X__ Fish collected from the same location
    __X__ Same species of fish collected
    _____ Same size of fish collected
    __X__ Same age of fish collected
    _____ Same sex of fish collected
    __X__ Same collection time
    __X__ Lipid normalization (optional)
    _____ Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    No

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    No

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    No

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Graphics, Kruskal Wallis

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

Thanks again for your time and effort on these questions.

Note: Smallmouth bass have been taken in recent years to examine the impact of dietary change (ex. Round goby) on contaminant levels. However, we are behind where we should be on this work.

U.S. EPA Great Lakes Fish Monitoring Program – *Open Water Trends Monitoring Program*

Fish Contaminant Trend Monitoring Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   __X__ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   _____ Edible-portion monitoring program
   _____ Other (please specify)

   The Open Lakes Trend Monitoring Program provides data to assess the health of fish and fish-consuming wildlife of the Great Lakes through monitoring of contaminant concentration trends in top predator fish, such as lake trout and walleye, and assessment of the overall effects of toxic chemicals on fish and fish-consuming wildlife. Top predator fish can be used as biological monitors of overall water quality and ecosystem health because contaminant concentrations in fish generally reflect overall contaminant levels in the environment. For example, contaminant concentrations in fish at the top of the food chain reflect contaminant levels in both the surrounding water and in organisms below them in the food chain (Biomagnification). Contaminant concentrations in fish also provide information about risks to organisms in higher trophic levels, such as fish-consuming wildlife.

   By monitoring contaminant trends in Great Lakes fish, we can determine whether the Great Lakes basin ecosystem is becoming healthier with regard to chemical contaminants. An increase in contaminant concentrations in top predators indicates a degrading environmental condition, while a decrease in contaminant concentrations in top predators indicates an improving environmental condition. Most importantly, measurement of contaminant concentrations is intended as a means to assess the progress towards the International Joint Commission's goal of safe consumption of fish by all wildlife. Fish-consuming wildlife rely upon fish for the majority of their diet, unlike humans with varied diets, and are therefore extremely susceptible to toxic contaminants in the environment.

2. What are the explicit goals of your FCMP (or individual program element)?

   _____ Collection of data for issuing fish consumption advisories
   _X____ Evaluation of trends of chemicals in the environment
   _____ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)

_____ Others: Please elaborate

3. How long has your program been in existence? 1976 - PRESENT

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? X Yes ___No

1976 The GLFMP begins through a cooperative agreement between the U.S. Environmental Protection Agency, Great Lakes National Program Office and U.S. Fish and Wildlife Service, Great Lakes Fishery Laboratory. The agreement documents the responsibilities of each agency, with GLNPO responsible for funding the chemical analyses and the GLFL responsible for collecting, processing and archiving the fish. The GLFMP begins monitoring lake trout (walleye in Lake Erie) for PCB's, DDT, dieldrin and oxychlordane in Lakes Superior, Michigan, and Erie. Lake trout from Lake Ontario are analyzed for PCBs, DDT and dieldrin. Whole fish are analyzed but instead of using individual fish (original protocol used by the GLFL), fish are grouped into composites. 60 fish are collected per site and sorted into three size categories. Within each size category, the fish are grouped into four composite samples consisting of five fish each. This is the first element of the GLFMP to be implemented and is later referred to as the Open Lake Trend Monitoring element. PCBs are now quantified as arochlor 1254 only. DDT is total DDT and includes p,p'–DDT, p,p'–DDE, p,p'–DDD. Fish are collected annually at two sites per lake.

1977 Lake Huron is added to the Open Lake Trend Monitoring element of the GLFMP.

1980 Two more elements are added to the GLFMP: Game Fish Fillet Monitoring and Emerging Problems in Harbors and Tributaries. For the Game Fish Fillet Monitoring element, samples are collected by the Great Lakes States annually and analyzed by the U.S. Food and Drug Administration's Laboratory in Minneapolis, Minnesota. The arrangement is documented through cooperative agreements between GLNPO and the Great Lakes States and GLNPO and the USFDA. The parameter list includes arochlor 1242, arochlor 1248, arochlor 1254, arochlor 1260, total PCBs (sum of arochlors), p, p' – DDE, p,p' –DDD, p,p' – DDT, total DDT, toxaphene, hexachlorobenzene, dacthal, dieldrin, endrin, a BHC, lindane, pentachlorophenylmethyl ether, trans nonachlor, trans chlordane, cis chlordane, cis nonachlor, octachlor epoxide, total chlordane, heptachlor epoxide, mirex, and 8 monohydro-mirex. For the Emerging Problems in Harbors and Tributaries element, samples are collected regularly by the Great Lakes States and then analyzed by the US Environmental Protection Agency's Central Regional Laboratory.

1982 Collection procedures are changed for the Open Lake Trend Monitoring element. 50 fish are collected in each lake and whole fish are composited into five fish composites for a total of ten composite samples per lake.

Lake trout collected are between 600 and 700 mm total length, and walleye are between 400 and 500 mm total length. Also, fish collections will now be conducted at each site every other year, rather than every year. So we now have an even year site and an odd year site for each of the Great Lakes.

1986 Oxychlordane is now monitored in Lake Ontario. Also, the chlordane components cis and trans nonachlor and cis and trans chlordane are added to the Open Lakes Trend Monitoring parameter list. Toxaphene is also added to the list.

1989 The Open Lake Trend Monitoring element is expanded to include the collection of 50 lake trout (or walleye, where there are no lake trout) and 50 smelt, from each of eleven locations – two in each of the Great Lakes and one in Lake St. Clair – every other autumn. The samples are analyzed for PCBs, DDT complex, dieldrin, chlordane, toxaphene, and mirex (Lake Ontario only).

1990 The Open Lake Trend Monitoring element begins analyzing for PCB congeners, specifically congeners (IUPAC nos.) 22, 42, 52, 77, 85, 99, 101, 105, 110, 114, 118, 126, 128, 138, 149, 151, 156, 157, 177, 180, 183, 185, 189, and 195. Total PCBs are based on Arochlor 1254 and concentrations are determined by summing 12 congeners, which are easily quantifiable and representative of the chlorination levels, for both the standard and the samples. More information on the PCB calculations can be found in the QAPP, *Monitoring Trends of Selected PCB Congeners and Pesticides in Fish from the Great Lakes, 1991, 1992, and 1993*, and also in the GLENDA database. Heptachlor epoxide is also added to the parameter list.

1994 The Open Lake Trend Monitoring element of the GLFMP adds many new analytes to its parameter list, including pentachlorobenzene, hexachlorobenzene, lindane, aldrin, octachlorostyrene, heptachlor epoxide-b, heptachlor epoxide-a, endrin, and the toxaphene homologues Cl6, Cl7, Cl8, Cl9, Cl10. Also, 80 PCB congeners will be analyzed. Total PCBs are calculated by summing the congeners.

1998 The USFDA is no longer able to participate in the GLFMP because the Minneapolis laboratory closes. The U.S. Geological Survey, Great Lakes Science Center (USGS/GLSC), formerly FWS, GLFL, agrees to process the fish from the Game Fish Fillet Monitoring element, along with the samples from the Open Lake Trend Monitoring element. The Great Lakes States are instructed to send their samples to the USGS/GLSC laboratory for processing. The game fish fillet composites are also analyzed in the same laboratory selected to analyze the open lake trend composites. The parameter lists are similar, although the game fish are still analyzed for a few chemicals not monitored in the Open Lake Trend Monitoring element, including alpha HCH, pentachlorophenyl methyl ether, dacthal and photo-mirex.

2001 The GLFMP conducts the "Workshop on Identifying Emerging Contaminants for Fish Contaminant Monitoring Programs." The overall purpose of the workshop is to provide a mechanism for updating the GLFMP contaminant list. The workshop results in the addition of PBDEs, PCNs, PCDD/Fs, PBB-153 and mercury to the routine monitoring list beginning with fish collected in the fall of the year 2000. Chemicals not added to the routine monitoring list, but considered potential candidates for future inclusion, are PFOS, TBBPA, SCCPs, APEs and chlorothalonil. The parameter lists for the two elements are now identical and include: PCB congeners, PCB co-planars, hexachlorobenezene, pentachlorobenzene, octachlorostyrene, lindane, alpha-BHC, aldrin, dieldrin, heptachlor epoxide a, heptachlor epoxide b, cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane, pp, op-DDT, pp, op-DDE, pp,op-DDD, endrin, mirex, toxaphene and homologs, dacthal, PBDEs, PCNs, PCDD/Fs, PBB-153 and mercury.

2005 The GLFMP decides to drop certain chemicals that are no longer being detected in measurable concentrations in Great Lakes fish. The following chemicals are dropped beginning with the 2001 fish: pentachlorobenzene, aldrin, heptachlor, heptachlor epoxide-a, o,p-DDT, o,p-DDE and o,p-DDE. Also, mirex is dropped in all lakes except Lake Ontario.

The GLFMP issues a Request for Proposals for the analyses of both the Open Lakes Trend Monitoring fish and the Game Fish Fillet Monitoring fish beginning with fish collected in the year 2004. Three of the previously routine analytes (PCNs, PBB-153 and dacthal) will no longer be measured every year, but rather will be included in the extended year program and analyzed once every five years. PFOS and other emerging chemicals will also be included in the extended year program, with the final list to be decided by the GLFMP steering committee.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

   __X__ Great Lakes
   _____ Great Lakes connecting channels
   _____ Inland rivers
   _____Inland lakes
   _____ Reservoirs or impoundments
   _____ Other (please describe)

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

   __X__ Every year
   _____ Fixed intervals (please describe)
   _____ Based on a randomized design
   _____ Case by case determination (if so, can you describe criteria)

_____ Other (please describe)

Annual monitoring at fixed locations on alternating schedule.

Lake	**Even Year**	**Odd Year**
Michigan	Saugatuck	Sturgeon Bay
Superior	Apostle Islands	Keewenaw Point
Huron	Rockport	Port Austin
Erie	Middle Bass Island	Dunkirk
Ontario	Oswego	North Hamlin

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

___x___ Total length
_____ Standard length
_____ Fork length
___x___ Weight
___x___ Age
___x___ Gender
_____ Reproductive condition
___x___ Lipid level or fat content
___x___ Other (please describe)?

Any additional information that may be interesting at the time.

8. What species of fish are collected? (Please check all that apply)

___x___ Lake Trout
_____ Sicowet Lake Trout
_____ Coho Salmon
_____ Chinook Salmon
_____ Brown Trout
_____ Rainbow Trout
___x___ Walleye (Lake Erie Only)
_____ Carp
_____ Yellow Perch
_____ Smallmouth Bass
_____ Largemouth Bass
_____ White perch
_____ Smelt
_____ Alewife
_____ Northern Pike
_____ Other? (please list)

9. What tissue is collected? (Please check all that apply)

___x___ Whole fish
_____ Untrimmed fillet with skins
_____ Trimmed fillet with skins
_____ Untrimmed skinless fillets
_____ Trimmed skinless fillets
_____ Dorsal plugs (please describe the length, width and weight)
_____ Other? (please elaborate)

10. Are individual or composite samples analyzed?

_____Individual fish or fish tissues are analyzed.

__x__Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

__X__ species
_____ age
__X__ length
_____ weight
__X__ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level
__x__ PCBs		
_____ Aroclors		
__x__ Congeners		
__x__ ΣDDT		
x o,p' DDT		
x p,p' DDT		
__x__p,p' DDE		
__x__p,p' DDD (TDE)		
__x__Mirex		
_____ Photomirex		
__x__ Σ Chlordane		
__x__ *α*-chlordane		
__x__ *γ*-chlordane		
__x__ cis-nonachlor		
__x__ trans-nonachlor		
__x__ oxychlordane		
__x__ Toxaphene		
__x__ Aldrin		
__x__ Dieldrin		

___x____Endrin

_____x Octachlorostryrene

x_____ Heptachlor epoxide

__x__ BHC

__x__ α BHC

__x__ δ BHC

_____ γ BHC

_____ Other Chemicals? Please list.

Analyte	**MDL, ng/g**
PCB congeners	0.002 – 1.0
PCB co-planars	0.002 – 1.0
Hexachlorobenzene	1
Octachlorostyrene	0.83
δ-BHC (Lindane)	0.606
α-BHC	4.7
Dieldrin	0.44
Heptachlor epoxide b	0.52
Cis-chlordane	1.814
Trans-chlordane	0.488
Cis-nonachlor	1.95
Trans-nonachlor	1.48
Oxychlordane	1.94
pp,-DDT	0.66
pp,-DDE	0.74
pp,-DDD	0.52
Endrin	2.86
Mirex (Lake Ontario only)	1.52
Toxaphene&homologs	24.6
PBDEs	0.001 – .10
Hg	0.521
Fraction lipid	5%
***PCDD/Fs**	**0.3 - 25**
***PCNs**	**0.2 – 6.0**
***Dacthal**	**1.0**
***PBB-153**	**0.1 - .2**
***PFOS**	**0.5**

***A scan for specified list of additional analytes, such as perfluorinated compounds, musk fragrances, APEs, pharmaceuticals and other personal care products (pseudo-persistence), other flame retardants, etc., will be conducted for one year of analysis. The final analyte list for the extended program will be decided by the GLFMP steering committee.**

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

    20 grams of sample

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

    __X__ Fish collected from the same location
    __X__ Same species of fish collected
    __X__ Same size of fish collected
    _____ Same age of fish collected
    _____ Same sex of fish collected
    __X__ Same collection time
    __X__ Lipid normalization
    _____ Others? (please elaborate)

14. Are other data collected to augment or complement the interpretation of BCC in fish? For example, do you collect limnological data such as pH or organic carbon to help describe the bioavailability and bioaccumulation of BCC in fish?

    Beginning in 2006, limnological data and organic information will be collected form the same locations as fish.

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    No

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

    Yes, 2 sets individual composites are saved for each lake (1 reg. 1 PFOS). In addition, a “mega” composite is saved that is a homogenization of all composites collected from a single site.

17. How are temporal trends evaluated, by perusal of data or simply looking at graphs, formal statistical analyses, or some other methods? Please describe in detail. For example, if statistics are used, what statistical methods are used, what null hypotheses are assumed, what if any transformations are performed, etc.

    Perusal of data and use of graphs. GLFMP grantee conducts additional statistical analysis when releasing results.

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

    Need to revisit age v. length question and question of representitiveness.

U.S. EPA Great Lakes Fish Monitoring Program – *Sport Fish Fillet Monitoring Program*

Fish Contaminant Trend Monitoring Questionnaire

Part I. Program Description

1. What type of fish contaminant monitoring do you conduct? (Please check all that apply)

   _____ Whole adult fish trend monitoring program
   _____ Young-of-year (YOY) trend monitoring program
   _____ Caged-organism monitoring program
   __x__ Edible-portion monitoring program
   _____ Other (please specify)

   Please attach a description of each element to this questionnaire. Additionally, if your program includes different elements, please answer questions 2 through 25 for each element.

   This component is directed at monitoring potential human exposure to contaminants through consumption of popular sport species, as well as providing trend data for top predator species that have shorter exposures than the lake trout collected in the open lakes component. The inclusion of coho salmon in this program also provides a snapshot of contaminant concentrations across the Great Lakes in fish of consistent age, complementing the size-based data collected in the open lakes component. The program provides for the collection of skin-on fillets from coho or chinook salmon (or rainbow trout, if neither is available) by the Great Lakes States. Fish samples are then analyzed for several different contaminants, including PCBs, toxaphene, chlordanes, nonachlors, and other organochlorine compounds.

2. What are the explicit goals of your FCMP (or individual program element)?

   _____ Collection of data for issuing fish consumption advisories
   _____ Evaluation of trends of chemicals in the environment
   _____ Evaluation of effectiveness of pollution control activities
   _____ Evaluation of environmental quality (e.g., attainment of the goals of the Clean Water Act, Remedial Action Plan, or Lakewide Management Plan)
   ___x___ Others: Please elaborate

   EPA does not issue fish consumption advice. States are able to use contaminant data from EPA in their own FCAs.

3. How long has your program been in existence? ___1980 - PRESENT____

4. Have there been any significant changes in methods (analytical methods, tissue type, labs, etc.) over that period? X Yes ___No

1976 The GLFMP begins through a cooperative agreement between the U.S. Environmental Protection Agency, Great Lakes National Program Office and U.S. Fish and Wildlife Service, Great Lakes Fishery Laboratory. The agreement documents the responsibilities of each agency, with GLNPO responsible for funding the chemical analyses and the GLFL responsible for collecting, processing and archiving the fish. The GLFMP begins monitoring lake trout (walleye in Lake Erie) for PCB's, DDT, dieldrin and oxychlordane in Lakes Superior, Michigan, and Erie. Lake trout from Lake Ontario are analyzed for PCBs, DDT and dieldrin. Whole fish are analyzed but instead of using individual fish (original protocol used by the GLFL), fish are grouped into composites. 60 fish are collected per site and sorted into three size categories. Within each size category, the fish are grouped into four composite samples consisting of five fish each. This is the first element of the GLFMP to be implemented and is later referred to as the Open Lake Trend Monitoring element. PCBs are now quantified as arochlor 1254 only. DDT is total DDT and includes p,p'–DDT, p,p'–DDE, p,p'–DDD. Fish are collected annually at two sites per lake.

1977 Lake Huron is added to the Open Lake Trend Monitoring element of the GLFMP.

1980 Two more elements are added to the GLFMP: Game Fish Fillet Monitoring and Emerging Problems in Harbors and Tributaries. For the Game Fish Fillet Monitoring element, samples are collected by the Great Lakes States annually and analyzed by the U.S. Food and Drug Administration's Laboratory in Minneapolis, Minnesota. The arrangement is documented through cooperative agreements between GLNPO and the Great Lakes States and GLNPO and the USFDA. The parameter list includes arochlor 1242, arochlor 1248, arochlor 1254, arochlor 1260, total PCBs (sum of arochlors), p, p' – DDE, p,p' –DDD, p,p' – DDT, total DDT, toxaphene, hexachlorobenzene, dacthal, dieldrin, endrin, a BHC, lindane, pentachlorophenylmethyl ether, trans nonachlor, trans chlordane, cis chlordane, cis nonachlor, octachlor epoxide, total chlordane, heptachlor epoxide, mirex, and 8 monohydro-mirex. For the Emerging Problems in Harbors and Tributaries element, samples are collected regularly by the Great Lakes States and then analyzed by the US Environmental Protection Agency's Central Regional Laboratory.

1982 Collection procedures are changed for the Open Lake Trend Monitoring element. 50 fish are collected in each lake and whole fish are composited into five fish composites for a total of ten composite samples per lake. Lake trout collected are between 600 and 700 mm total length, and walleye are between 400 and 500 mm total length. Also, fish collections will now be conducted at each site every other year, rather than every

year. So we now have an even year site and an odd year site for each of the Great Lakes.

1986 Oxychlordane is now monitored in Lake Ontario. Also, the chlordane components cis and trans nonachlor and cis and trans chlordane are added to the Open Lakes Trend Monitoring parameter list. Toxaphene is also added to the list.

1989 The Open Lake Trend Monitoring element is expanded to include the collection of 50 lake trout (or walleye, where there are no lake trout) and 50 smelt, from each of eleven locations – two in each of the Great Lakes and one in Lake St. Clair – every other autumn. The samples are analyzed for PCBs, DDT complex, dieldrin, chlordane, toxaphene, and mirex (Lake Ontario only).

1990 The Open Lake Trend Monitoring element begins analyzing for PCB congeners, specifically congeners (IUPAC nos.) 22, 42, 52, 77, 85, 99, 101, 105, 110, 114, 118, 126, 128, 138, 149, 151, 156, 157, 177, 180, 183, 185, 189, and 195. Total PCBs are based on Arochlor 1254 and concentrations are determined by summing 12 congeners, which are easily quantifiable and representative of the chlorination levels, for both the standard and the samples. More information on the PCB calculations can be found in the QAPP, *Monitoring Trends of Selected PCB Congeners and Pesticides in Fish from the Great Lakes, 1991, 1992, and 1993*, and also in the GLENDA database. Heptachlor epoxide is also added to the parameter list.

1994 The Open Lake Trend Monitoring element of the GLFMP adds many new analytes to its parameter list, including pentachlorobenzene, hexachlorobenzene, lindane, aldrin, octachlorostyrene, heptachlor epoxide-b, heptachlor epoxide-a, endrin, and the toxaphene homologues Cl6, Cl7, Cl8, Cl9, Cl10. Also, 80 PCB congeners will be analyzed. Total PCBs are calculated by summing the congeners.

1998 The USFDA is no longer able to participate in the GLFMP because the Minneapolis laboratory closes. The U.S. Geological Survey, Great Lakes Science Center (USGS/GLSC), formerly FWS, GLFL, agrees to process the fish from the Game Fish Fillet Monitoring element, along with the samples from the Open Lake Trend Monitoring element. The Great Lakes States are instructed to send their samples to the USGS/GLSC laboratory for processing. The game fish fillet composites are also analyzed in the same laboratory selected to analyze the open lake trend composites. The parameter lists are similar, although the game fish are still analyzed for a few chemicals not monitored in the Open Lake Trend Monitoring element, including alpha HCH, pentachlorophenyl methyl ether, dacthal and photo-mirex.

2001 The GLFMP conducts the “Workshop on Identifying Emerging Contaminants for Fish Contaminant Monitoring Programs.” The overall

purpose of the workshop is to provide a mechanism for updating the GLFMP contaminant list. The workshop results in the addition of PBDEs, PCNs, PCDD/Fs, PBB-153 and mercury to the routine monitoring list beginning with fish collected in the fall of the year 2000. Chemicals not added to the routine monitoring list, but considered potential candidates for future inclusion, are PFOS, TBBPA, SCCPs, APEs and chlorothalonil. The parameter lists for the two elements are now identical and include: PCB congeners, PCB co-planars, hexachlorobenezene, pentachlorobenzene, octachlorostyrene, lindane, alpha-BHC, aldrin, dieldrin, heptachlor epoxide a, heptachlor epoxide b, cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, oxychlordane, pp, op-DDT, pp, op-DDE, pp,op-DDD, endrin, mirex, toxaphene and homologs, dacthal, PBDEs, PCNs, PCDD/Fs, PBB-153 and mercury.

2005 The GLFMP decides to drop certain chemicals that are no longer being detected in measurable concentrations in Great Lakes fish. The following chemicals are dropped beginning with the 2001 fish: pentachlorobenzene, aldrin, heptachlor, heptachlor epoxide-a, o,p-DDT, o,p-DDE and o,p-DDE. Also, mirex is dropped in all lakes except Lake Ontario.

The GLFMP issues a Request for Proposals for the analyses of both the Open Lakes Trend Monitoring fish and the Game Fish Fillet Monitoring fish beginning with fish collected in the year 2004. Three of the previously routine analytes (PCNs, PBB-153 and dacthal) will no longer be measured every year, but rather will be included in the extended year program and analyzed once every five years. PFOS and other emerging chemicals will also be included in the extended year program, with the final list to be decided by the GLFMP steering committee.

5. What types of aquatic systems are monitored by your FCMP? (Please check all that apply)

_____ Great Lakes
_____ Great Lakes connecting channels
_____ Inland rivers
_____ Inland lakes
_____ Reservoirs or impoundments
__x__ Other (please describe)

River mouths meeting the Great Lakes

6. How frequently do you repeat monitoring at sites? (Please check all that apply)

__X__ Every year
_____ Fixed intervals (please describe)
_____ Based on a randomized design
_____ Case by case determination (if so, can you describe criteria)

_____ Other (please describe)

Part II. Program Logistics and Mechanics

7. What non-chemical information is collected about the fish? (Please check all that apply)

___x___ Total length
_____ Standard length
_____ Fork length
___x___ Weight
___x___ Age
___x___ Gender
_____ Reproductive condition
___x___ Lipid level or fat content
___x___ Other (please describe)?

Any additional information that may be interesting at the time.

8. What species of fish are collected? (Please check all that apply)

_____ Lake Trout
_____ Sicowet Lake Trout
___x___ Coho Salmon (even year only)
___x___ Chinook Salmon (odd year only)
_____ Brown Trout
___x___ Rainbow Trout (Lake Erie only)
_____ Walleye
_____ Carp
_____ Yellow Perch
_____ Smallmouth Bass
_____ Largemouth Bass
_____ White perch
_____ Smelt
_____ Alewife
_____ Northern Pike
_____ Other? (please list)

9. What tissue is collected? (Please check all that apply)

_____ Whole fish
___x___ Untrimmed fillet with skins
_____ Trimmed fillet with skins
_____ Untrimmed skinless fillets
_____ Trimmed skinless fillets
_____ Dorsal plugs (please describe the length, width and weight)
_____ Other? (please elaborate)

10. Are individual or composite samples analyzed?

_____Individual fish or fish tissues are analyzed.

___x___Tissue from more than one fish is combined into a composite sample.

If composite samples are analyzed, then which of the following factors are considered when combining tissues? (Please check all that apply)

__x__ species
_____ age
__x__ length
_____ weight
__X__ collection date
_____ sample volume
_____ Other (please describe)

11. What bioaccumulative chemicals of concern (BCC) are analyzed? What are the methods and quantification levels?

Analyte	Analytical Method	Quantification Level
x PCBs		
Aroclors		
x Congeners		
x ΣDDT		
x o,p' DDT		
x p,p' DDT		
x p,p' DDE		
x p,p' DDD (TDE)		
x Mirex		
Photomirex		
x Σ Chlordane		
x *α*-chlordane		
x *γ*-chlordane		
x cis-nonachlor		
x trans-nonachlor		
x oxychlordane		
x Toxaphene		
x Aldrin		
x Dieldrin		
x Endrin		
x Octachlorostryrene		
x Heptachlor epoxide		
x BHC		
x α BHC		
x δ BHC		
γ BHC		
Other Chemicals? Please list.		

Analyte	MDL, ng/g
PCB congeners	0.002 – 1.0
PCB co-planars	0.002 – 1.0
Hexachlorobenzene	1
Octachlorostyrene	0.83
δ-BHC (Lindane)	0.606
α-BHC	4.7
Dieldrin	0.44
Heptachlor epoxide b	0.52
Cis-chlordane	1.814
Trans-chlordane	0.488
Cis-nonachlor	1.95
Trans-nonachlor	1.48
Oxychlordane	1.94
pp,-DDT	0.66
pp,-DDE	0.74
pp,-DDD	0.52
Endrin	2.86
Mirex (Lake Ontario only)	1.52
Toxaphene&homologs	24.6
PBDEs	0.001 – .10
Hg	0.521
Fraction lipid	5%
***PCDD/Fs**	**0.3 - 25**
***PCNs**	**0.2 – 6.0**
***Dacthal**	**1.0**
***PBB-153**	**0.1 - .2**
***PFOS**	**0.5**

***A scan for specified list of additional analytes, such as perfluorinated compounds, musk fragrances, APEs, pharmaceuticals and other personal care products (pseudo-persistence), other flame retardants, etc., will be conducted for one year of analysis. The final analyte list for the extended program will be decided by the GLFMP steering committee.**

12. What is the minimum amount of homogenate needed to conduct analysis for your laboratory?

20 grams of sample

Part III. Quality Control, Data Analysis, and Interpretation of Trends

13. Are the FCMP data used to evaluate temporal or spatial trends of BCC? If so, what if any methods are used to control for confounding factors that also affect concentrations of chemicals in fish over time and space. (Please check all that apply)

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    Beginning in 2006, limnological data and organic information will be collected form the same locations as fish.

15. Are BCC data collected in other media (e.g., water column, sediments or biota) to complement the fish studies? If so, please describe.

    No

16. Does your program archive tissues or extracts? If so, please describe this aspect of your program.

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    Perusal of data and use of graphs. GLFMP grantee conducts additional statistical analysis when releasing results. Concentrations are compared to Protocol for Uniform Fish Consumption Advice categories.

18. Please think about the elements of your FCMP with respect to monitoring and detecting trends. What methods have worked well for deducing trends from time to time and space to space? What has not worked as well as expected?

Part IV. Conclusion and Summary

19. Based on your experience, can you think of any important points or questions concerning interpretation of your fish contaminant data that are not covered by the questions above? Are there areas of uncertainty or factors that you think should be addressed by our analysis? If so, please list them and describe why you think they are important?

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